Business Plan Project

Visakhapatnam

Final Report

Prepared for

VISAKHAPATNAM PORT TRUST

by

ROTTERDAM MARITIME GROUP
In co-operation with

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Introduction

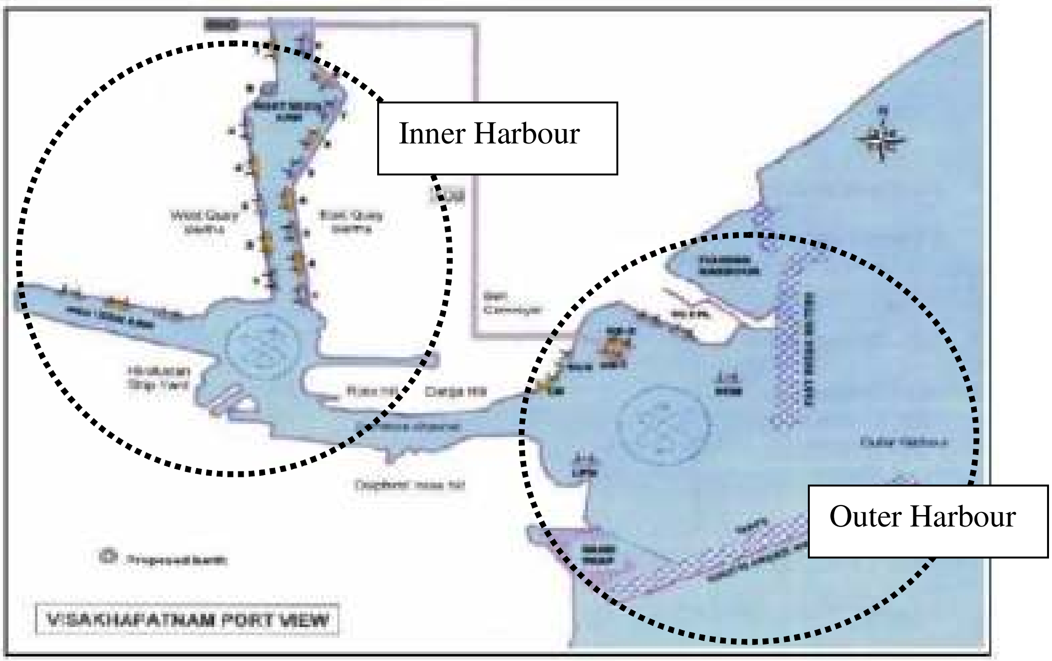
This report presents the business plan for Visakhapatnam Port Trust. Based on the vision and the mission for the port, the potential traffic that will be generated in the future, the investments needed to cope with the future demand, the report discusses the financial implications of the business plan and also provides an action plan for the coming business plan period. The shortfall in capacity and the improvement of the cargo handling systems leads to an investment program as well as to the necessary organisational improvements to assure an effective port system and an efficient implementation of the proposed investments. This investment program has been integrated in a financial model of the port in order to determine the financial implications. The plan forms the basis for the actions of VPT for the coming business plan period.

Port of Visakhapatnam

Visakhapatnam Port on the Indian East Coast located at 17^0 41’ N and 83^0 18’ E is almost equidistant from Kolkata and Chennai. The port is a premier Indian port in terms of annual traffic (cargo throughput). The port is a major bulk handling port with POL, Iron Ore and Coal being the major bulk commodities. Other commodities handled in substantial quantities are Iron & Steel, Fertilizers & Fertilizer Raw Materials and Alumina.

The port of Visakhapatnam has maintained its first national market position when it comes to throughput for the last six years and surpassed the mark of 55 million tons of cargo throughput in the year 2005-06 out of a total of 423.4 Mt for all major ports.

Map 0-1 Location of berths in Visakhapatnam



Vision and Mission
Based on the results of a workshop, the consultant and VPT came to the following vision:

"VPT to be the most preferred port in South Asia offering services of global standards"

The Brand is:

"The East Coast Gateway"

The Mission Statement is:

"To be a major partner in meeting the logistics requirements of the importers and exporters of the region"

Strategy
The port development strategy aims at increasing the port's capacity to facilitate higher cargo volumes by introducing improved infrastructure and modern handling techniques. Expansion of the port should be focused on the Outer Harbour by developing new deep-water berths and improving cargo handling rates. Dry bulk arriving in vessels above 100,000 dwt should be exclusively be handled in the Outer Harbour. Crude should either be handled in the Outer Harbour or outside the breakwater using SBM's. Cargoes arriving in vessels up to 50,000 dwt will be handled in the Inner Harbor. Several berths in the Inner Harbour allow for the development of multi-user facilities operated by private companies, dedicated berths on a BOT-basis or on a lease base. Over time, further deepening of the Inner Harbour is foreseen to accommodate for Panamax-size vessels.

The optimal situation is one without waiting time. Due to the existing congestion the port should for the short term set a goal of a maximum waiting time of e.g. 24 hours. This target will set the ports' and berths' occupancy taking multi-user application into account.

Measures to reduce the waiting time are:

- Better berth planning, a higher efficiency due to mechanization will contribute to more berths days and less chance that the berth is occupied.
- Due to increase of the GCB, less shifting with vessels is required and waiting time will be reduced.
- The constraints with night navigation, especially with large tankers will be solved when the SBM is operational since tankers can moor during the night.
- The agents need to improve the paper works, use more IT and EDI in order to speed the required documentation.
- The agents need to plan the vessels better in closer cooperation with the port.

The policy of VPT is to continue with the implementation of the landlord model further and as such being responsible for:

- Basic infrastructure
- Construction of quay walls (if no BOT arrangement is applicable)
- Harbour Master's function: safety and environment
- The promotion of the Port
- Marine services
- Divestments of non-core activities; this may generate funds that can be used for investments that form part of the core activities of the Port Authority. In addition, investments via BOT may be structured in such a way that existing equipment is sold. The marine services will in the short and medium term remain under the control of VPT in order to avoid a monopolistic situation. In the short term the establishing a Commercial Department is highly recommended.

Consultants are of the opinion that the available financial means within VPT are insufficient to cope with the future investments, especially taking into account that *"speed is needed"* to beat the upcoming competition on the East Coast. For one project, the rehabilitation of the Ore Handling Complex, VPT has entered into a loan agreement with Japanese Bank for International Co-operation (JBIC) at favourable terms.

Private capital has to be attracted to implement the investments needed. When this is applied for, a BOT-arrangement is recommended. In such arrangement, particular attention should be paid to the conditions that need to assure the interests of the port authority, for instance, performance benchmarks.

Table 0-1 Financial options

Option	Judgement
Own equity	Insufficient
Subsidies	Probably not available
Soft loans	With international donors is go to go decision. This involves long periods.
Soft commercial loans	International donors for specific purposes
Commercial loans	Depends on the availability of collateral, requires financially feasible projects for relatively short finance period, while projects are long term
Private Sector Participation	Attract private capital

Source: Consultants analysis

Strengths and weaknesses, opportunities and threats

Both international and domestic market developments are considered to be highly favourable on the short, medium and long term. This rapid growth is anticipated to occur in all sectors of the economy.

The Indian government has formulated an ambitious investment program aimed at supporting the developments in the economy. India's growing integration with the global economy and its favourable demographics are likely to ensure an average sustained rate of growth of GDP of more than 6% annually up to 2010, and up to 9% a year in the period 2010-20.

One of the main challenges for the Indian economy is to create sufficient infrastructural capacities in the road, rail and ports. The SWOT assessments indicate that the port will continue to benefit from its natural strengths, but its current biggest weakness is the inefficiency in operations and its future position is being threatened by the proximity of the competing ports as well as the bureaucratic procedures.

Customer's satisfaction

A number of customers were met and interviewed and their feedback on port facilities and services were obtained. The analysis shows that rail and road connectivity, productivity and tariffs were all scoring high to relatively high on customer satisfaction.

Storage facilities, paper work, local taxes and levies, IT services and customs procedures are all areas where the port could improve its service to the customers and which should be the focus of attention.

Safety of cargo in storage, safe handling of cargo, cargo handling and marine services were the areas where the port scored mediocre, where the customers generally found the service good.

General statements made from the customers include the following points:

- High capacity cranes with grabs and conveyor system required
- Truck parking and moving area
- Housekeeping should improve
- Pollution control should be improved
- Improvement in paperwork/procedures
- Adequacy of tugs and pilots
- Improving draft at strategic locations where volume can spur immediately.

All the comments and results of the report are presented in annex 3

VPT's place and future

Visakhapatnam Port ranks 1st among the 12 major ports in terms of throughput volumes; a position it has been holding consistently over the last several years. The Ministry of Transport has set targets for Visakhapatnam for the year 2013-14, which indicated that Visakhapatnam port should grow by another 80%, or approximately 8% annually. Most of that growth has to come from POL related traffic, as well as coal. The growth in the previous ten years was an average of around 4.5% per year. As such, the target implies almost a doubling of the growth rates.

Analysis of the recent seaside Origins and Destinations showed the rapid growth of Iron Ore exports to China, which has risen in 2004-05 before falling back in 2005-06. Considering the very strong economic growth of China, a further growth of this trade is however likely. Furthermore, there has been a marked shift in coastwise exports to the West of India, particularly to Hazira and Mumbai. This will likely be sustained given their prosperous economic prospects.

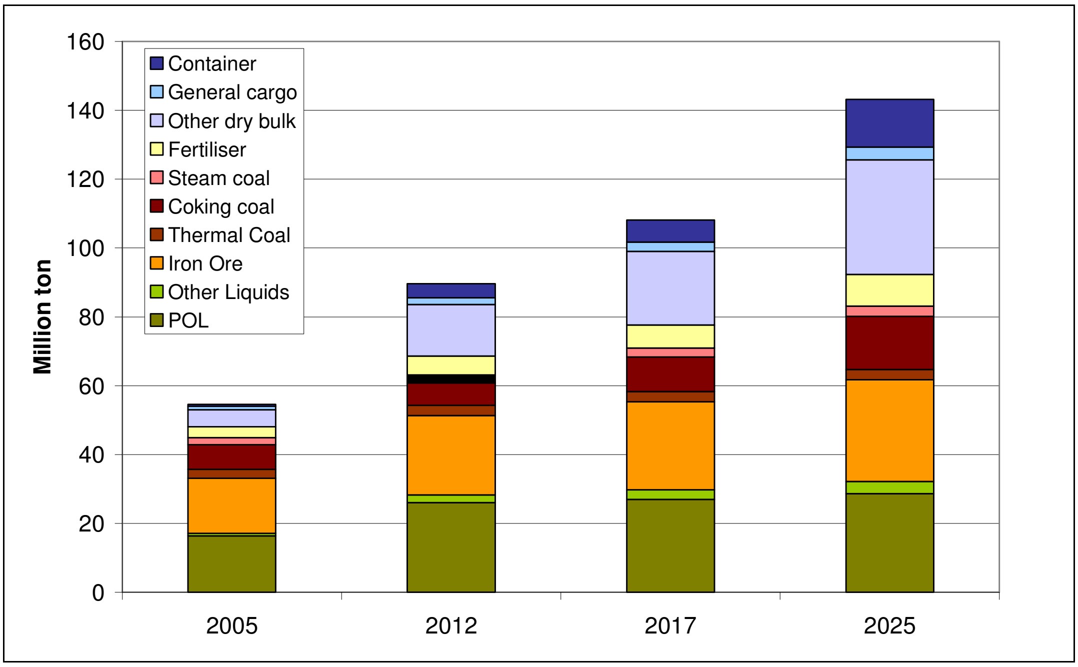
The table below summarizes the cargo forecast for VPT. It appears that cargo grows from 55 Mt in 2005-06 to well over 89 Mt in 2012-13. Nearly one-third of this increase originates from a single project, namely the expansion of the refinery. Much depends also on the expansion of the steel and POL industries. The downside risk of the forecast is estimated to be around 6-10 Mt while an upside is then expected to be very small indeed, if existent, as the new port of Gangavaram will open by 2008-09.

Table 0-2 Summary of cargo forecast for VPT, 2005/06-2012/13 (in Mt)

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
POL	16.6	15.0	15.6	16.7	18.3	20.2	22.5	26.0
Other liquids	0.7	0.8	0.9	1.0	1.3	1.8	1.9	2.5
Iron Ore	16.0	17.5	17.5	19.0	20.0	20.0	20.0	23.0
Thermal coal	2.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Coking coal imports	7.1	7.3	7.5	7.0	6.2	5.7	6.0	6.5
Steam coal	2.0	1.5	2.2	2.3	1.9	2.0	2.2	2.3
Fertilizer & FRM	3.2	3.5	3.9	4.2	4.5	4.9	5.2	5.5
Other dry bulks	3.1	3.5	3.7	3.8	5.1	7.4	8.1	10.7
General Cargo / Break Bulk	2.9	3.2	3.6	3.9	4.5	4.9	5.6	6.2
Containers	0.6	0.8	1.3	1.9	2.4	2.9	3.5	4.0
Total	54.8	56.1	59.2	62.8	67.2	72.8	78.0	89.7

For the long term, a trend analysis combined with large scale projects indicates that the port may see cargo demand of 140 Mt by 2025.

Figure 0-1 Long term trend forecast of cargo demand, Mt



While some of the long term projections are based on CAGR growth trends and where appropriate specific circumstances are taken into account. The main arguments per commodity are:

- In the case of POL, traffic at VPT will be restricted by refinery capacity in the service area
- Other liquids include raw materials for fertilizers and alumina plants and will register matching growth

- Iron ore exports will see a slow down on account of domestic steel industry growth and hence a growth of only 10 million tons beyond 2013 is projected
- Thermal coal projections are not based on trends as it is dependent on TNEB requirement alone. With the Kudangulam Mega Nuclear Power Plant coming up and the Kalpakkam Plant being expanded, thermal power as a proportion of total power is expected to decline in TN and hence traffic is estimated based on the assumption that coal will continue to be an important fuel for power generation but traffic growth will be marginally incremental
- Coking and steam coal imports will also continue to increase at the same pace in the light of domestic steel industry growth
- In the case of Fertilizers too the current growth trend is likely to continue on the back of the emphasis being given by GoI to agriculture growth flattening out of fertilizers demand as has happened in the developed world is not expected to occur in India within the period the projections are made.
- Other dry bulks include alumina, cokes and limestone. With the likelihood of several of the alumina mining projects coming through in Orissa and the mines being predominantly being in southern Orissa, VPT will attract the cargoes for these plants However, the growth beyond 2017 may not be as significant as between 2013 and 2017 when the mining leases and plants reach optimum levels
- General cargo / break bulk growth will be limited by the growing trend in containerization of general cargo
- Container traffic is bound to grow at a rapid pace on account of the vibrant economic growth that will trigger a higher growth in manufacturing sector than at present

Present Port Operations

Factors which are effecting further improvement in productivity

1. Entrance channel to the Inner Harbour is a narrow channel with lot of bends and curves. The maximum vessel size that can be handled at Inner Harbour is 45,000 DWT and 10.06 m. draft. Because of the limitation of the Inner Harbour to handle Panamax vessels which are deployed for Coking coal and Fertilisers the only deep draft berth is General Cargo berth which is being utilized for accommodating deeper draft ships putting lot of pressure on this berth and avoidable pre-berthing detention to vessels at anchorage. This limitation is being addressed by the Port by deepening Inner Harbour entrance channel and turning circle in phases of which phase-I is nearing completion.
2. There is scope for further improvement in productivity if the following issues are addressed.
    a. Inadequate bagging facility for foodgrain and fertilizers restricting ship shore discharge rate.
    b. Inadequate stacking space close to the operational area resulting in long lead for cargoes handled at Inner harbour.
    c. Allotment of stacking space can be done on a move rational basis with less lead time.
    d. There are no handling equipment on the western side of the Northern arm. Vessels accommodated at these berths are handling cargo with ship gear. In the event of arrival of ships with lower capacity ship gear / inadequate ship gear, obsolete gear, productivity is adversely affected.
    e. About 65% of cargo is moved by Railways from and to the hinterland. Availability of adequate no.of railway wagons is a pre-requisite for faster evacuation of cargo. In the recent past it is observed that the supply of wagons by Railways is not commensurate

with the ship shore discharge resulting in building up huge stacks which in turn is affecting productivity of vessels at berth.

f. There is no night navigation facility for crude oil tankers of more than 115000 DWT. This is resulting in detention of tankers calling at the port.

g. There is an urgent need to rationalize and modify the incentive schemes. Datums were laid down 10 years ago and are not really acting as an incentive to enhance productivity. The datums are so low that with higher capacity grabs, labour are able to achieve these norms during the middle of the shift itself resulting in low productivity for certain cargoes.

h. Multiple handling of coking coal and other bulk cargoes is affecting further improvement in the productivity and also affecting quality of the product.

Some of the other factors which are effecting productivity at the berths are:

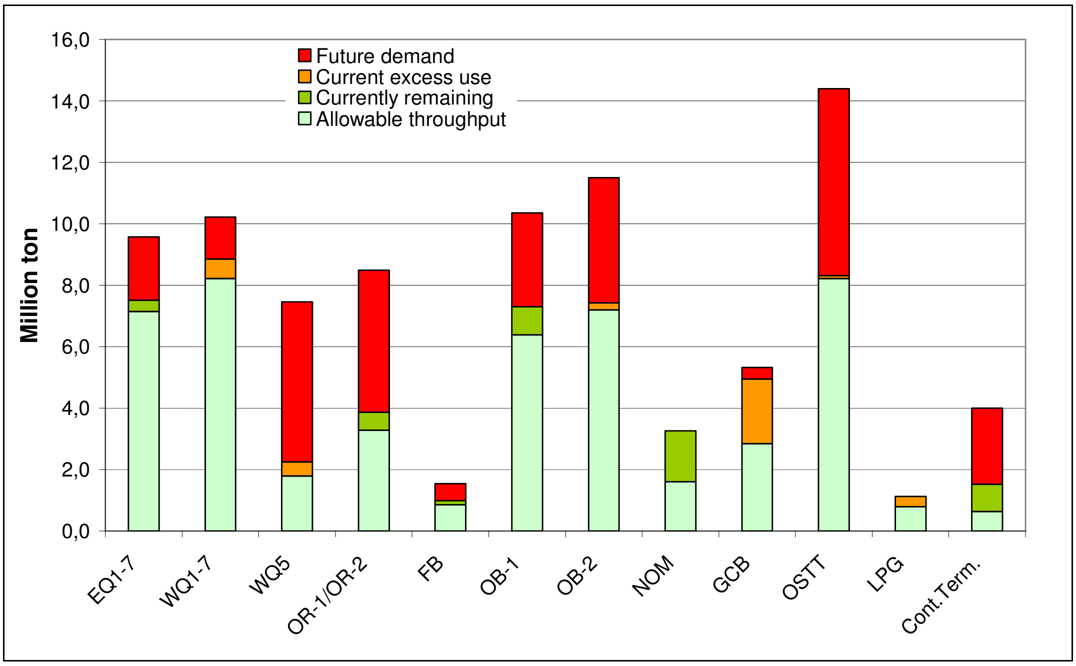
i) Inadequate connectivity for the container terminal.
ii) Inadequate no.of weigh bridges.
iii) Inadequate lighting at stackyards.
iv) Inadequate drainage system.
v) Inadequate availability of trucks for movement of cargoes.
vi) Inadequate facilities at Railway sidings.

The above mentioned factors which are effecting further improvement in productivity will be discussed in the various section herafter in the report. Solutions to improve the productivity are highlighted and discussed in Sections 4 and 5.

The port handling capacity

Current capacity use is given in following chart. Most facilities are either already used up to maximum capacity or well beyond that, resulting in congestion. Orange is indicating the shortfall of capacity that is already experienced at the moment. In Red the present capacity is compared with the future throughput levels according to the traffic forecast and current use of the facilities.

Figure 0-2 Capacity use by berth group, 2005-06 versus 2012-13



There clearly already is an overall shortfall in port capacity, even when taking into account the present remaining capacity of 2.7 Mt over several berths, although mostly on Ore Berth 1. Waiting times are rising for most berths and suboptimal logistics are occurring, resulting in high costs for the port users. Current capacity is estimated at 57 Mt for the port, excluding the transhipment on the anchorage. This however includes acceptance of congestion and waiting times as currently experienced.

Creating port handling capacity

Immediate solutions are required to de-bottleneck the current situation and to accommodate future growth. VPT has listed a number of projects to cope with the current problems and future demands. Consultants have added further projects. These investment projects could result in an additional capacity of 70 Mt, while there would still be spare capacity in the sense of undeveloped berths. Part of the projects is replacement of existing capacity, as mechanisation is undertaken. The combined cost of the main projects is just over Rs 1,800 Crore and the other projects account for Rs 550 Crore The main projects are:

Export facility for Bulk cargoes WQ1/WQ2:

Dry bulk, in specific, the import and export of coal is handled at almost all west and east quays in the inner harbour and at the General Cargo berth at the outer harbour. Thermal coal is presently manually loaded with slings, mainly at the west quays, which result in a long TRT for ships and high berth occupancies.Thermal coal and part of the iron ore are presently manually loaded, mainly at the west quays, which result in both high TRT for ships and high berth occupancies. This can be improved by the development of a mechanized loading and stacking facility.

The result is that operations are environmentally friendlier than the present operations, due to the fact that the coal is concentrated at one location and is less handled by various types of equipment. At the same time loading rates will be much higher and ships have a shorter turn around time in the port and can save on the ship cost.

Mechanisation General Cargo Berth

The existing general cargo berth is used for only import of dry bulk such as coking coal, coke and fertilizer. Unloading is done by either ship's gear or two floating cranes. In 2005 – 2006 the cargo throughput at the GCB was about 5 Mt, resulting in berth occupancy of about 98% (298 days). According to the market study, the expected amount of imported coking coal and coke is in the order of 11 Mt per year. A mechanized unloading facility in combination with a stacking yard with stacker-reclaimers and wagon loading installation is proposed. The handling productivity will increase from 10,000 tons per day to 50,000 tons per day.

Deepening Inner harbour to 14m draft

The deepening of the entrance channel draft to the inner harbour and the inner harbour itself to 14 m draft is intended to make the inner harbour suitable for Panamax vessels. However the entrance channel to the inner harbour is very narrow and curved and access with a Panamax vessel should be carefully checked with nautical simulation.

Accommodation of 200k Dwt vessels Iron Ore Jetty and upgrading of the Iron Ore Handling Complex

The iron-ore jetty has two berths, OB-1 and OB-2 requires debottlenecking in the handling facilities to increase capacity up to 20 million ton with berth occupancy of 60%. Clients have expressed interest in using 200,000 Dwt vessels, which requires extension of the jetty and further deepening. This project is integrated with the redevelopment of the entire Iron Ore Handling Complex and financed under a JBIC agreement.

SBM facility & POL jetty

Presently all crude import of about 7.5 million ton per year is handled at the Offshore Tanker Terminal (OSTT) which is considered the limitation of the berth. Space is limited in the outer harbour and solutions were sought in a development of a SBM outside the breakwaters. The SBM will be used predominately for the discharge of crude. It is expected that it can handle about 20 million ton of crude per year.

POL products are both imported and exported through the port. Current capacity is limited to the approximate 4.5 Mt handled. Most of this is handled at OR-1 and OR-2 at the inner harbour. It is expected that the POL will be more than doubled to 10 million ton in the coming years. The berths capable of handling POL are the LPG jetty and the OSTT, which are fully occupied, even after the development of a SBM outside the port. More capacity to handle POL jetty is needed. To this end, the current NOM will be replaced within the Outer Harbour area, while the OR-berths will be re-vamped to accommodate bigger vessels and and higher pumping rates. The same is foreseen for the LPG jetty, while the remaining product vessels may be handled on the OSTT.

Extension of container terminal

The extension of the container terminal will be developed under a concession agreement with the current concessionaire on the basis of right of first refusal. The extension should be negotiated early in the business plan period in order to create the space required for new cargoes as well as to have the space available as and when container traffic takes off.

East Docks and strengthening of the East Quays 1-4

Due to the deepening of the inner harbour several berths at the East Quays need to be strengthened or replaced due to the fact that the deepening goes beyond the design depths of these berths. Besides this, the quays were constructed in 1937 and have exceeded the design life time.

The involved berths according to the VPT are quays, EQ 1, 2, 3, 4, 5, 6, and 7. The EQ 1-4 will be upgraded to a vessel draft of 14 m and will be constructed about 25m from the original water line in order to widen the channel. It has been decided that only East Quays 1 through 4 will be revamped and upgraded to 14 m draft capability as and when sufficient traffic justifies the investment. The project will be implemented via a concession with a potential operator.

In addition to the East Quays, the East Docks will be developed for the handling of general cargo and for coal.

These East Docks in the Inner Harbour will be developed on the basis of concessions. The South side of the Docks will be developed for the imports of coal from smaller vessels. The unloading facilities will be connected to the main system being built for the GCB. The concession is to be integrated with that of the GCB. The North side of the East Docks will be developed at a later stage, as and when cargo demand requires so.

Other projects include strengthening of quay walls and construction of berths in the Inner Harbour.

Table 0-3 Summary of projects

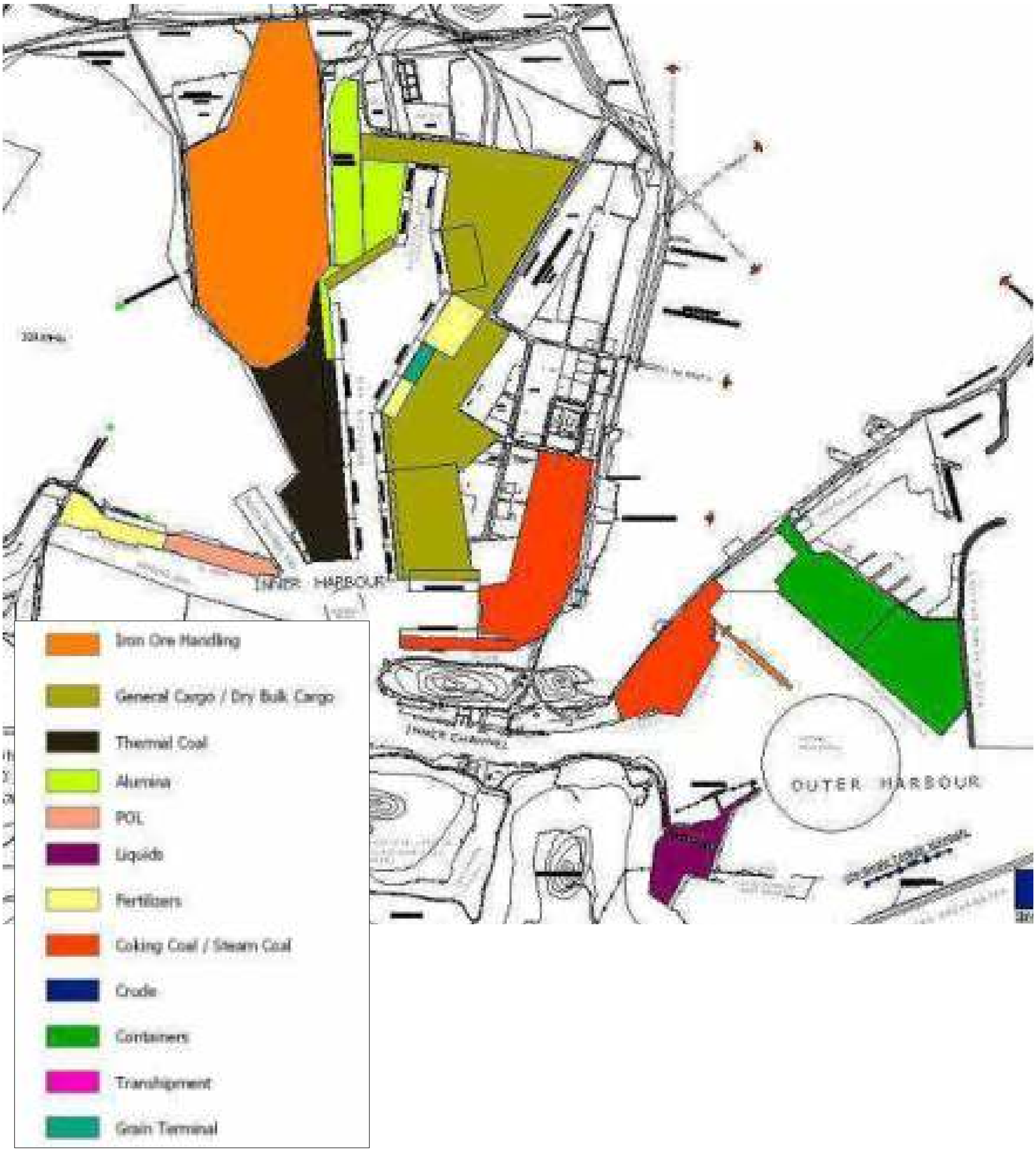
Project	Capacity Mt	Cost Rs Crore.	Decision made
Export facility for Bulk Cargo WQ1/WQ2	3-6	117	
Import facility Granular fertiliser EQ1-3	4-10	77	Concession in the future
Mechanisation General Cargo Berth	11	237	Implement via Concession
Deep Water Dry Bulk terminal	16	385	Rejected
Deepening Inner harbour to 14m draft	3*	150	Not viable, implementation on hold
200k Dwt vessels Iron Ore Jetty	3.5*	50	Implementation via VPT
POL jetty		113	Rejected
Relocation Oil mooring		30	Implementation VP
SBM facility	15	540	Implementation via Concession
Relocation of container terminal		99	Rejected
East Docks development	8.5	207	Implementation in phases via Concession
Replacement equipment Iron Ore Handling complex and remaining costs on upgrading complex		203	Implementation via VPT
Extension Container Terminal	4	120	Implementation via Concession
Total main projects		1,834	
Total other waterside related projects		551	
Grand total		2,385	

Note: * capacity based on targeted cargo.

The projects listed above account for well over 70 Mt of capacity. Part of this is replacement of existing capacity, as mechanisation is undertaken. Some projects have relatively short lead times and consultants advise that these should be undertaken as soon as possible to relieve the congestion. The other projects require lead times due to the necessity of further detailed analysis and the simple reason that substantial construction is to be undertaken. The business plan period can be used to initiate discussions with users, undertake thorough market research and start planning accordingly. In any case, for projects that are clearly single-user, discussions should be held with clients to obtain commitments of cargo or direct investment. For multi-user berths, independent terminal operators may be attracted.

The lay-out of the port is as follows after implementing the projects.

Figure 0-3 New port lay-out



Marine services

In view of the future traffic forecast and the size of vessel and the number of vessel calls the projects for the replacement of the tugs is envisaged. For night berthing, two linked projects are required. First, the mouth of the entrance channel needs to be widened. Furthermore, a 75 tons Bollard Pull tug is required to provide sufficient power. The envisaged replacement of one of the tugs could be replaced by a 75 tons tug. For handling of VLCC's an additional two tugs with 70 tons Bollard Pull are required.

Land use

The port of Visakhapatnam has a huge land area admeasuring 4,368 ha. The table below provides the distribution of this land according to its existing use.

Table 0-4 Details of the major break up of Port land and Land Use of VPT

Land use	Hectares (Ha)	Percentage
Land alienated to defence	1345	30.8
Land leased for port based industries	1128	25.8
Waterways of inner harbour	101	2.3
Land occupied by hills and nallas	441	10.1
Land for residential purpose	80	1.8
Land for recreational complex	26	0.6
Land for port's operational buildings	20	0.5
Land for port's operational areas (docks, road, rail lines, stacking area, OHC)	716	16.4
Land leased for warehouses	87	2.0
Land proposed for lease to establish warehouses/CFS	60	1.4
Land for long term lease for cargo related activities and bulk storages	324	7.4
Land for green belts	40	0.9
Total land owned by VPT	4,368	100

The existing land use has limited land for operational activities. It can be seen from the table that about one third (30.8%) of the land is alienated for the defence related activities. Nearly one fourth (25.8 %) of the land is leased for port based industries. Substantial portion of the land is occupied by hills and nallas (open drains) which pose problems for development. The land dedicated for the port's core operations such as docks, stacking area, OHC, roads, rail system is about 716 ha (16.4%) with green belts occupying slightly less than one percent of the land.

The residential area around the old town adjacent to the outer harbour of the port is a major hindrance to the expansion plans of the port. The movement of cargo from and to the outer harbour has to be through a long route circumventing a hillock to avoid movement of heavy vehicles through the city. One of the major problems faced by the residents of the areas close to the port is of pollution due to handling of coal/iron ore etc. In order to mitigate the air pollution, the port has taken several measures such as installation of sprinklers, providing a green belt all around the port premises.

Land development strategy

VPT handled about 56 Mt of cargo in the year 2005-06. It is expected that this traffic is likely to grow to about 89 Mt by 2012-13. Keeping this increase in cargo in mind it becomes important for the port to make necessary provisions to make the land available for the essential uses such as storage, roads, rails, sidings etc. Considering these facts, it is recommended that VPT can consider following strategies for land development in order to meet the port's future needs.

- ***Acquiring the land adjacent to the port***
  It involves acquisition of the land after relocation of the existing structures. Suitable land areas around the port can be identified and explored for acquisition. Consultants have attempted to identify such locations based on site observations and discussion with the port officials and described in the preliminary land use plan proposals.
- ***Changing the existing land use within port area***
  There are a lot of opportunities in terms of land use changes in the port area; for example, east yard dump and area adjacent to the east quays can become future operational and transit zone for the port and could solve the future stacking and transit requirements, thus enhancing the port business. Underutilised land could be used for new uses. It is understood that about 1,437 acres of land available with VPT for different schemes such as establishing warehouses, CFS, storage etc.
- ***De-leasing the existing land given on lease***
  VPT has leased about 2,892 acres of land to various parties for port based industries. As a part of development of ware houses phase – I the land is already allotted to various parties (RCL, Prathusha, CWCL etc.). Consultants propose that VPT to have a constant check on the land leased and its use by the lessee and should try to find out the land pieces which are un/under utilised so that they can be de-leased if found necessary.

Table 0-5 Recommended actions for the land use

Title	Key Features	Project Cost
Preparation of detailed master plan for port area for 20 years perspective	Identify existing land-use zones and future land-use zones Implementation plan for the same Continuous monitoring and review for the same	Preparation of master plan = 1 crore
Identification of suitable areas for future stacking areas and connectivity between inner harbour and outer harbour	identify suitable areas available for acquisition around the port area carry out feasibility for acquisition covering area of land to be acquired, land-holding details, cost of the land, legal requirements, etc. find out if these areas are populated and population density if people reside, VPT should conduct detailed rehabilitation and relocation study for project affected persons (PAP) as per the multilateral funding agency guidelines	For feasibility study and R & R study = 1 crore
Revamping of East yard dump area – development of stack yards	Development of additional stack areas by demolishing of the existing structures Additional area available for stacking and ancillary activities = 9.5 ha Provision for peripheral arterial road along operational areas Provision of service roads Provision for transit truck terminal Relocation of existing structures near convent Junction (area requirement = 3.5 ha built up)	Development of stack yards (after demolishing, relocation and site development) Roads (about 4 km peripheral road with 3 km service roads) = 15 crores
Truck terminal	Location - opposite the Essar plant and on southern side of the new connectivity road Area requirement = 3.8 ha Proposed capacity 750 trucks per day Provision of facilities such as parking, staying, repair, fuelling etc.	To be developed by Public Sector Privatisation (PSP)
Development of Buffer zone	Location – near the major operation area in the east yard dump as well as near the proposed acquisition area near the outer harbour. Area available = 18.5 ha Development of additional stack areas by demolishing of the existing structures	For Cost refer to the environment section

Consultants recommend that VPT should formulate a detailed land use master plan with 20 years perspective which would have all the proposals included in the business plan and their phasing. It is also recommended to monitor and review land use plan every two years.

Upgrading internal connectivity and environment

Internal movements between outer and inner harbour areas assumes importance as these improvements bring in the benefits in terms of lesser travel distance/time, fuel savings, better operation conditions etc. The internal transport projects focus mainly on the road/rail traffic circulation within port areas and include the schemes identified for road/rail connectivity improvement of outer and inner harbour areas and associated storage spaces.

Consultant proposes to implement the following road projects:

- Outer harbour connectivity improvement involving
  - Improvement of road from Khobbari Thota Junction to the fishing harbour junction facilitating movement to/from Port Junction to Outer harbour berths (upto Fishing Harbour) with an estimated cost of about Rs. 15 crore
  - flyover roads on the above OH connectivity road and one connecting outer harbour to inner harbour with an estimated cost of about Rs. 12 crore
- Inner harbour connectivity improvement includes following proposals
  - In/out movement to EQ to/from outside the port - Ramp near Ambedkar Junction for facilitating traffic movement to/from EQ north gate with an estimated cost of about Rs. 16 crore
  - In/out movement to/from WQ port area – flyover road with ramps to facilitate WQ in/out and movement towards WQ and EQ with an estimated cost of about Rs. 34.5 crore
  - Movement between EQ to WQ area (both ways) – flyover road on either side of the conveyor with an estimated cost of about Rs. 33 crore
- Western sector connectivity for which three options are possible. Out of these option one, additional road parallel to the bridge over Meghadrighedda is the cheapest one. However, this option was ruled out due to the decision of the navy to ban the existing road. Out of the other two options, the option no 3 seems to be the better one and can be considered for implementation. It was suggested by the port that the option 2 may also be considered for the long term requirement.

The consultants propose to implement the following rail projects:

- Providing additional connectivity to Mindi yard from RCL, between the proposed Mindi yard and Karasa area where the storage capacity is planned. The estimated total cost of implementation is Rs. 30 crore.
- Revamping the east yard for the new storage and mechanical handling for coal with an estimated cost of about Rs. 7.5 crore

The other regular modernisation and improvement projects for general improvement of the road and railway system have to be taking into account according to the availability of budget.

External connectivity

Adequate port connectivity to hinterland is very important as it helps smooth movement of cargo to and from hinterland. About 60-65 % cargo is rail borne cargo and about 10-15 % is handled via road. VPT has initiated the connectivity improvement on both the fronts. For road connectivity improvement it has recently completed construction of the Port Connectivity Road. It seems to be sufficient for existing and future traffic. For rail connectivity improvement, VPT is in the process of developing another reception and dispatch yard at Mindi, as the existing facilities are unlikely to be able to cope with the projected future cargoes.

Environment

Considering the various potential sources of pollution, pollution control measures are suggested at either the source of pollution or at the receiving environmental component. Adoption of these measures would help keep the pollution control costs to a minimum. Environmental projects are a key component of every Port operation and construction program. Port's capital improvement programs must provide funds for needed environmental measures. The Port's environmental programs are as varied and vital as its economic programs. The projects that have been identified deal with Air pollution, noise pollution, water pollution from ship and shore based facilities and include the following:

Table 0-6 Possible environmental projects

S.N	Possible Projects	Cost (Rs. Cr.)	Path/Benefits
1	Shifting of coal handling from GCB to coal berth and mechanisation of coal berth		Covered as part of main projects
2	Controlling of vessel emissions and vehicular pollution		This is a recommendation - VPT has to consider various options with ship operators
3	Provision of earmuffs and other equipment to workers and at noisy environments	0.5	VPT has to provide /To avoid health hazards
5	Construction of slurry holding tank on iron ore berth	2.5	VPT has to construct /To Avoid harbour water and aquatic flora and fauna contamination
6	Detailed quantitative and qualitative Investigation of City wastewater meeting Harbour area and install a Sewage Treatment Plant to treat city sewage	25.0	VPT has to construct /To avoid harbour water pollution
7	Study for industrial wastes and finding out suitable solution	0.5 for study (tentative Cost of ETP would be 40 lacks per mld)	Consultant has to be engaged to examine and control harbour water pollution
8	Provision of flooring, Garland drains, collection pits, and greenbelt around Stacking yards, and ancillary port activities	14.0	VPT has to construct/To restrict polluted surface run off meeting harbour water and Air pollution control
9	Disposal of sediments		Recommendation
10	Change of dredges for capital dredging		Recommendation to put condition in tender documents
11	Handling of wastewater and oil spills from ships	1.0	Recommendation
12	Strengthening of Environmental Management Cell	2.0	VPT should strengthen existing Cell to address environmental management concerns. The cell should be given qualified persons who will be responsible for regular environmental quality" monitoring, proper operation of pollution control equipment and ETPs, and liaison with regulatory bodies such as the Andhra Pollution Control Board (APPCB)
13	EIA for all Construction Components	1.0	EC is mandatory by MoEF and SPCB. For EC detailed EIA is required EIA would take at least 12 months which include 9 months monitoring
14	Slope protection in inner harbour	5.0	
Total		48.8	

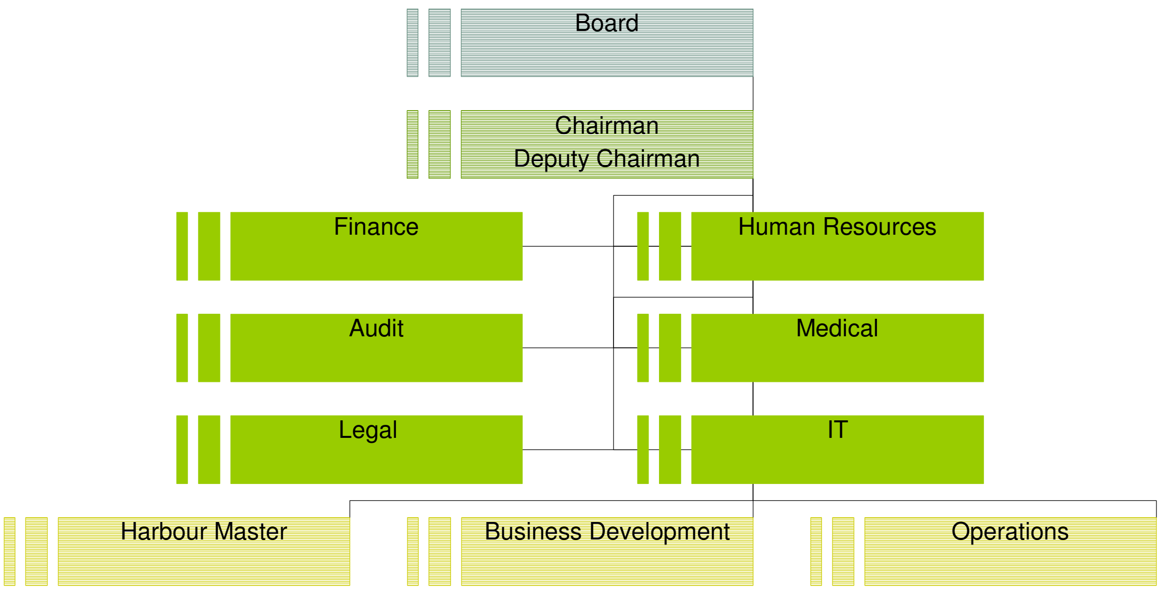
Adjustment of the organizational set-up

Adopting the concept of a landlord port model requires first of all institutional changes. Consultants recommend corporatising of the VPT as such the VPT will act as an independent unit under the corporate law. The shareholders could be the Government of India and/or the State of Andhra Pradesh. The VPT will become a Port Authority with as main functions port developer, custodian and maintainer. A change in the name of the new organisation is recommended in line with this transformation: **Visakhapatnam Port Authority (VPA).** By adopting the land lord model the corporatised VPA acts then purely as:

- stimulator of the port as logistic nodal point;
- developer and maintainer of port areas, entrance channel, terminals, jetties, storage areas, etc; and
- lessor of port property: long/short term lease/concessions for mainly infrastructure and in some cases superstructure.

In view of above the VPT will be transformed into a corporate body acting under the corporate law and the new organization will act as a Port Authority. The organisation shall focus on marine services and commercial services aided by the support functions. Consultants have perceived the following organization structure befitting for the future needs of the VPA.

Figure 0-4 The proposed organisation of VPT new style



In the new structure of the corporatised VPT the following layers can be distinguished:

- The board of the organization consisting of representatives of the shareholders;
- The management of VPA
- The staff departments (indicated in green) such as Finance, HRD, Legal, etc
- The departments in line:
    - Marine Services
    - Business Development
    - Operations

Money and prioritisation: Financial Plan

In the end, there is a trade-off between available money, solutions and goals. Not all projects should be undertaken, some should be paid for by the user, and others can be postponed. The starting point for those decisions is the current financial position of the port and its likely development over the forecast period. The table below presents some major financial indicators of VPT for the years 2003/04-2005/06.

Table 0-7 Financial indicators for the years 2003/04-2005/06

	2003/04	2004/05	2005/06
Net margin	17%	2%	30%
Operating ratio	43%	45%	44%
Current ratio	1.3	1.5	1.1
Debt to assets	0,0	0,0	0,0
Revenue per ton (Rs)	101	99	95
Cost per ton (Rs) (excl. financial items, incl. depreciation)	64	60	59
Net surplus per ton (Rs)	17	2	29

Source: Consultant's calculations on basis of data provided

The net margin of the port has increased from 17% in 2003/04 to 30% in 2005/06, while the operating ratio has remained static at around 44%. The current ratio has fallen to 1.1 over the past three years as the current liabilities have increased. Revenues per ton have fallen from 101 to 95 Rs./ton, but at the same time, the cost per ton has fallen as well, to reach 59 Rs. per ton. The net surplus per ton has increased to 29 Rs. per ton. It should be noted that these values have been impacted considerably by the (non-)payments to the Pension Fund.

At present, VPT shows sound credit rating. The financial strength of VPT makes co-financing feasible. The current debt to total assets ratio is nearly zero as per the balance sheet of 2005-06, and the debt to equity is likewise nearly zero. In capital intensive industries ratios of 2 are common. However, in order to be prudent, a ratio of 1 is reasonable initially.

Proposed investments

The proposed projects together amount to a total capital expenditure Rs. 2,970 Cr.. This amount includes also projects that will not be implemented during the current planning period through 2012/13. Of the total amount, around Rs. 1,140 Cr. is for the account of VPT; the remainder is to be covered by private operators. In 2007/08, an amount of Rs. 170 Cr. is likely to be spent, rising to Rs. 275 Cr. in 2008/09 and then dropping to Rs. 159 Cr. and further to Rs. 45 Cr. by 2012/13

The most important near-term investments for VPT are the rehabilitation of the Iron Ore Handling complex. This project includes the deepening of the entrance channel, the construction of an extension to the existing jetty and the replacement of the major equipment. The project is held by the Port, so that all cargo related revenue will flow back to the port. Furthermore, quay-strengthening projects need to be financed by the Port as well as rail track investments at the GCB. Almost all other waterside-related investments will be undertaken by private operators. A substantial amount of money is required for roads and railway-equipment, Rs. 229 Cr. and Rs. 163 Cr. respectively. Combined, these projects amount to 35% of the investments from VPT funds.

Deepening of the Inner Harbour to cater for vessels with a draft of 14m will only be undertaken as and when sufficient cargo is available. Financing of the project will only be undertaken through private investment or via external funds that require no paybacks and interest from the port. An overview of the projects and associated annual capital expenditures is given in the table below.

Table 0-8 Projects and associated annual capital expenditure (in Cr. Rs.)

Project	Carry out	Operational	Capacity	Investment (Rs. Cr.)		Annual capex (Rs. Cr)						
						2006	2007	2008	2009	2010	2011	2012
		year	Mt	VPT	Private	2007	2008	2009	2010	2011	2012	2013
Mechanisation export facility WQ1/2 (VPT 23)	yes	2008		22.5	94.3	11.3	11.3	0.0	0.0	0.0	0.0	0.0
Mechanisation GCB (VPT 22)	yes	2009		65.3	171.7	0.0	32.7	32.7	0.0	0.0	0.0	0.0
Mechanised import facility EQ1/3	yes	2015		2.3	74.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iron Ore lengthening (VPT 4)	yes	2012		50.0	0.0	0.0	0.0	0.0	0.0	20.3	29.8	0.0
SBM (VPT 13)	yes	2009	15	0.0	540.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POL/Liquids (VPT 20)	no	2009	10	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Installation shiploader Alumina WQ7 (VPT 10)	yes	2010	2.5	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repairs to WQ-7 (VPT 5)	yes	2008	2	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replacement Equipment I.H. Berths (VPT 24,26)	yes	2008	4.5	58.0	0.0	19.3	19.3	19.3	0.0	0.0	0.0	0.0
Replacement tugs (VPT 27, 30)	yes	2009		40.0	0.0	0.0	0.0	20.0	20.0	0.0	0.0	0.0
New tugs 75T BP (1)	yes	2009		90.0	0.0	0.0	0.0	45.0	45.0	0.0	0.0	0.0
Deepening Entrance Channel / Inner Basin to 14m (VPT 3)	yes	2014		0.0	150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deepening Entrance Channel / Inner Basin to 12,5m (VPT 2)	yes	2008		0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Strengthening E. Quays (VPT 11, 12) to 14m	yes	2014		0.0	120.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Strengthening W. Quays (VPT 6,7,8) to 12,5m	yes	2008		46.5	0.0	0.0	23.3	23.3	0.0	0.0	0.0	0.0

Project	Carry out	Operational	Capacity	Investment (Rs. Cr.)		Annual capex (Rs. Cr)						
						2006	2007	2008	2009	2010	2011	2012
		year	Mt	VPT	Private	2007	2008	2009	2010	2011	2012	2013
Construction WQ6 (VPT 9)	yes	2009		0.0	45.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marine services Lova Garden	no	2010		20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construction WQ8 (VPT 15)	yes	2010	5.1	50.0	0.0	0.0	0.0	16.7	16.7	16.7	0.0	0.0
Extension Container Terminal (VPT 16)	yes	2011	4	0.0	120.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upgrading OR1-2 (VPT 19)	yes	2011	3	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Procurement barges and launches (VPT 20)	yes	2010		6.0	0.0	0.0	0.0	2.0	2.0	2.0	0.0	0.0
Road (VPT 32, 33, 34, 37)	yes	2011		229.0	0.0	0.0	45.8	45.8	45.8	45.8	45.8	0.0
Other works (VPT 41, 42, 43, 44, 50 and 45, 49)	yes	2011		61.9	70.0	0.0	12.4	12.4	12.4	12.4	12.4	0.0
Environmental (VPT 46,48)	yes	2012		45.0	0.0	0.0	0.0	9.0	9.0	9.0	9.0	9.0
East Docks (VPT 18), South Side	yes	2009	5	30.0	88.5	0.0	0.0	0.0	30.0	0.0	0.0	0.0
East Docks (VPT 18), North Side	yes	2015	3.5	0.0	88.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mobile Cranes 2*100t (VPT 29)	yes	2007		0.0	45.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construction EQ10 (VPT 14)	yes	2009	2	0.0	35.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mechanised facilities coal handling East Docks South (VPT 25)	yes	2009		0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replacement 2 locos 1430 HP & 1 loco 3100 HP (VPT 28, 31)	yes	2010		34.0	0.0	0.0	0.0	11.3	11.3	11.3	0.0	0.0
Rail (VPT 35, 36, 38)	yes	2011		129.0	0.0	0.0	25.8	25.8	25.8	25.8	25.8	0.0
Shifting of Fishing harbour (VPT 51)	yes	2011		85.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Residual costs on VPT 4 (Project 5)	yes	2012		145.0	0.0	0.0	0.0	0.0	36.3	36.3	36.3	36.3
Residual payments (Sheet 16/11/06: VPT1)	yes	2006		13.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0
Liquids lines/Loading arms LPG Jetty	yes	2009	1.5	23.0	0.0	0.0	0.0	11.5	11.5	0.0	0.0	0.0
Total				1,140.5	1,830.2	43.6	170.5	274.7	265.7	179.5	159.0	45.3

The Marine Services require new tugs. Furthermore, restructuring of the organisation is required, which can entail VRS and substantial commitments. In addition, there is an obligation to top up the Pension Fund, which may require as much as 450 Crore. In sum, around 3,000 Crore is proposed, of which 1,150 Crore is for dedicated liquids facilities and accommodating 200,000 Dwt Ore carriers. These projects will be user paid. This also applies to the dry bulk mechanisation, the mechanisation of the GCB, the fertiliser import facility and the extension of the Container Terminal.

The GCB should be developed immediately by the port in order to relieve congestion. User benefits are very high in terms of reduced turn-around-time. The port is planning to fund this project as a BOT.
The fertiliser berth should be studied at the soonest. This project is needed and has large economic spin off.

Profits and losses

Total revenues for the port as indicated, have risen to 529 Cr. Rs., of which Cargo Handling and Storage accounts for 53%, or 279 Cr. Rs. Total employment costs have been held fairly constant through lay-offs and retirements, despite increasing wages. It should be noted that the employment costs are indicated here as total costs, covering regular salaries, bonus payments, pension contributions and other staff related payments.

Table 0-9 Profit and loss accounts 2006/07-2025/26 (in Cr. Rs.)

Item	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2017/18	2025/26
Revenues	**454**	**502**	**529**	**513**	**515**	**558**	**597**	**622**	**645**	**746**	**799**	**843**
Total costs	**260**	**276**	**296**	**314**	**351**	**356**	**362**	**334**	**338**	**349**	**328**	**281**
EBITDA	**194**	**226**	**233**	**199**	**165**	**202**	**236**	**289**	**306**	**397**	**471**	**562**
Depreciation	27	28	31	34	34	38	47	49	58	67	62	42
EBIT	**167**	**198**	**202**	**165**	**131**	**164**	**189**	**239**	**249**	**330**	**410**	**521**
Total financial items	**-57**	**-167**	**10**	**-50**	**-52**	**-51**	**-84**	**-84**	**-89**	**-5**	**61**	**199**
EBT	**110**	**31**	**212**	**115**	**79**	**113**	**105**	**156**	**160**	**325**	**471**	**720**
Tax	32	20	57	35	24	34	32	47	48	97	141	216
Net income	**78**	**11**	**155**	**81**	**56**	**79**	**74**	**109**	**112**	**227**	**330**	**504**

As the port is privatising its operations, its income from cargo handling will drop over time. As not all berths are yet designated to be privatised, a residual income from cargo handling remains on the profit and loss account.

- Total cargo related revenues are expected to remain static in the base case at around Rs. 250 Cr. and increase to Rs. 290 Cr. by 2012/13. Note that as royalties and wharfage tariffs are identical, this does not make a difference to the total revenues of the port. Vessel related revenues are forecast to grow steadily from Rs. 162 Cr. to Rs. 225 Cr in 2012/13 and further to Rs. 263 Cr. in 2025/26.

- The royalties will take over the function of wharfage dues. With the gradual transfer of operations to private operators, royalties are set to grow from Rs. 16 Cr. in 2008/09 to Rs. 94 Cr. in 2012/13 and further to nearly Rs. 139 Cr. in 2025/26.
- Total revenues of the port are thus forecast to grow from Rs. 513 Cr. in 2006/07 to Rs. 746 Cr. in 2012/13 and further to nearly Rs. 850 Cr. in 2025/26.
- Repair and maintenance costs are set to rise by 17% through 2012/13 as projects are implemented.
- Total costs will rise and then fall over the entire forecast period, hovering around Rs. 300 Cr. as repair and maintenance cost increases are offset by salary reductions and privatisation heaves off costs to private operators.
- The EBITDA rises from Rs. 199 Cr. to Rs. 326 Cr. by 2012/13 and can then rise further to Rs. 562 Cr. by 2025/26.
- Depreciation increases gradually from Rs. 34 Cr. to Rs. 67 Cr. These amounts are comparatively low, as most assets have long lifetimes.
- The tax obligation rises in line with profit, from Rs. 35 Cr. in 2006/07 to around Rs. 97 Cr. in 2012/13 and further to Rs. 216 Cr. in 2025/26
- Net income is thus set to grow from Rs. 81 Cr. in 2006/07 to Rs. 227 Cr. in 2012/13 and may rise to Rs. 504 Cr. in 2025/26.

Balance sheet

The balance sheets show that the total assets have grown from 1180 Cr. Rs in 2003/04 to 1538 Cr.Rs in 2005/06. A substantial increase has taken place in investments/financial means, which are accounted for under the current assets. At the same time, fixed assets have been added almost equal to depreciation values and resulted in a static total fixed assets position of some 740 Cr. Rs.

The loan position as of book-year 2005-06 was very low indeed, at just below 16 Cr. Rs.. However, during the current year 2006-07 a new loan has been taken up by the port to finance the rehabilitation of the Iron Ore Handling complex. The amount involved is 200 Cr. Rs, at favourable financial terms. The Yen-dominated loan carries an interest rate of 1.5% and pay-back period of 20 years, but the outstanding amount can be repaid at any time.

Overall, it can be concluded that the financial position of VPT is good and the Port has considerable funds for future expansion as well as substantial leverage possibilities.

A forecast of the balance sheets is presented in the table below.

Table 0-10 Balance Sheet 2006/07-2025/26 (in Cr. Rs.)

Item	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2017/18	2025/26
Assets												
Fixed assets	739	745	739	749	886	1,123	1,342	1,472	1,573	1,552	1,246	1,508
Investments	204	198	448	448	448	448	448	448	448	448	448	448
Investment reservation				124	229	41	105	39	14	228	1,828	4,753
Current assets & Liquid means	236	257	351	351	362	383	397	411	420	429	446	526
Total assets	**1,180**	**1,199**	**1,538**	**1,672**	**1,925**	**1,995**	**2,292**	**2,370**	**2,455**	**2,657**	**3,969**	**7,236**

Item	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2017/18	2025/26
Equity and Liabilities												
Equity	996	1,021	1,202	1,283	1,339	1,418	1,492	1,601	1,712	1,940	3,390	6,846
Loans	20	18	16	16	206	196	419	393	366	339	206	26
Current liabilities	164	160	320	373	381	381	381	377	377	378	373	364
Total equity and liabilities	**1,180**	**1,199**	**1,538**	**1,672**	**1,925**	**1,995**	**2,292**	**2,370**	**2,455**	**2,657**	**3,969**	**7,236**

Source: Consultant's calculations

The balance sheet total of the port rises from Rs. 1,672 Cr. in 2006/07 to Rs. 2,657 Cr. in 2012/13 and can then grow further to Rs. 7,236 Cr. in 2025/26. The increase is built up of additions to the fixed assets, which will increase more than 100% by 2012/13 and then fall again as depreciation outweighs replacement under the current capital budget program. The loans will be paid off by 2025.

An additional loan of Rs. 250 Cr. will have to be taken up by 2008/09 under the scenario assumptions, in order to pay for all investments. The loan is assumed to be paid back over 15 years and carry an interest rate of 9%.

It should be noted that this balance sheet assumes that the retained earnings are kept in the company and entered on the Balance Sheet as investment reservation, earning a 4% interest. This assumption reflects the need for a Landlord port to focus on its Public Service tasks, where significant dredging is required. Furthermore, the Port's long term needs imply expansion either outwards or inwards. A rough estimate of the cost of such expansion inward is Rs. 900 Cr. for the inward option and around Rs. 3,000 Cr. for the outward option. With the reservation fund, the Port will be equipped to undertake such a project.

Cash-flow

The total cash-flow of the port (see table below) will be negative for several years with the two largest negative years in the period 2008-2010 when the bulk of the immediate investments is expected to take place in financial terms.

Table 0-11 Estimated Cash flow, Cr. Rs.

	Years								
Item	**2006/7**	**2007/8**	**2008/9**	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2017/18**	**2025/26**
Net Surplus	81	56	79	74	109	112	227	330	504
Plus interest after tax	0	2	2	18	16	15	14	8	0
Plus NCC (non-cash item - Depreciation etc)	34	34	38	47	49	58	67	62	42
Minus change in NWC (net working capital changes)	-8	1	15	13	12	8	7	-1	20
Minus capex	44	170	275	266	179	159	45	0	379
Total cash flow	78	-80	-171	-141	-17	18	257	401	147

Source: Consultant's calculations

Given the expected cash flow and key indicators, the port can be expected to require loans in the order of Rs. 250-400 Cr. in order to carry out all the projects that are now decided to be implemented. This financing requirement, however, will not jeopardise the port's solvency. The debt to assets ratio increases to nearly 0.3 at its peak. The financial outlook is very sound indeed and sufficient funds should be generated to sustain re-investment and expansion investment as the port and its users require so.

The outcomes appear robust for substantial variations, although the near term is susceptive to strong negative cash flow. If and when the projected substantial returns materialise over the medium to long term, the port will have to think carefully about what to do with the proceeds.

Examples are:

- Co-invest in infrastructure with private clients is a possibility, in order to obtain higher royalties, if and when the projects are viable.
- As traffic and throughput grows, the port is likely to be required to undertake substantial infrastructure investment. An example of this may be the widening of the entrance channel to accommodate two-way traffic. This would require construction of new breakwaters, which is a very capital intensive project.
- Many Major ports are now undertaking and planning capacity expansion. At the same time, private ports are increasing capacity and being constructed. As such, it is likely that at some point in the medium term, more than sufficient capacity is available, and then competition will rise and tariffs will come under pressure. A healthy reserves position is then favourable in order to be able to lower tariffs and thus retain cargo.

The business plan period can be used to initiate discussions with users, undertake thorough market research and start planning accordingly. In any case, for projects that are clearly single-user, discussions should be held with clients to obtain commitments of cargo or direct investment. For multi-user berths, independent terminal operators may be attracted.

In the long term

The present capacity of the port is about 55 Mt. After implementation of the projects as described before the total capacity of the Port of Visakhapatnam comes around 120 Mt, which will be sufficient for the coming 15 years, which implies that the Port will reach its full capacity around 2020. For the period thereafter 3 options remain:

- Consolidation of the Port activities;
- Extension of the port activities by creating a new outer harbour;
- Capacity extension by creating a second inner harbour.

The results of a very rough calculation suggests that the investment cost of a Inner Harbour (about US$ 150 million) is substantially lower than expansion of the Outer Harbour (about US$ 650). The consultant emphasizes that these cost figures are based on very rough estimates for unit costs as well as for sizes/volumes; uncertainties and associated margins have to be taken into account.

Moreover annual savings can be obtained. On the average the costs per tonkm comes to about 5 to 10 USD cents. Assuming that 50 million tonnes of cargo are transported, the saving in the annual transportation costs will come to 25 upto 50 mln USD per annum. These annual savings occur by expanding the Inner Harbour versus the Outer Harbour. As such, it is highly unlikely that expansion of the Outer Harbour can ever be justified on economic arguments as long as the Navy might be persuaded to vacate the area.

Glossary

Acronym	Description
ACC	Associated Cement Companies
AIS	Automatic Information System
AP	Andhra Pradesh
APPCB	Andhra Pradesh Pollution Control Board
BALCO	Bharat Aluminium Company
BOT	Build Operate Transfer
BPO	Business Process Outsourcing
CAGR	Compound Annual Growth Rate
CCI	Cement Corporation of India
CETP	Common Effluent Treatment Plant
CFL	Coromandel Fertilisers Limited
CHA	Container Handling Agent
CLO	Calibrated Lump Ore
CRM	Customer Relations Management
CWC	Central Warehousing Corporation
DLB	Dock Labour Board
DWT	Dead Weight Tonnage
EA	Export Application
EIA	Environmental Impact Assessment
EIU	Economist Intelligence Unit
ELTS	Efficiency Linked Tariff Scheme
EMC	Environment Management Cell
EQ	East Quay
ETP	Effluent Treatment Plant
EU	European Union
FACOR	Ferro Alloys Corporation
FAI	Fertiliser Association of India
FB	Fertilizer Berth
FOIS	Freight Operations Information System
FRM	Fertiliser Raw Materials
GCB	General Cargo Berth
GDP	Gross Domestic Product
GFCL	Godavari Fertilisers and Chemicals Limited
GOI	Government of India
GRT	Gross Registered Tonnage
HGPL	Hy Grade Pellets Limited

Acronym	Description
HPCL	Hindustan Petrochemicals Corporation Limited
HSD	High Speed Diesel
IA	Import Application
ICCL	Indian Charge Chrome Limited
ICEGATE	Indian Customs and Excise Gateway
ICT	Information and Communication Technologies
IDBI	Industrial Development Bank of India
IDCOL	Industrial Development Corporation of Orissa Ltd.
IFFCO	Indian Farmers & Fertilizers Corporation
IGM	Import General Manifest
IH	Inner Harbour
IHTB	Inner Harbour Turning Basin
IIL	Ispat Industries Limited
INCAP	Infrastructure Corporation of Andhra Pradesh Limited
IOC	Indian Oil Corporation
IPA	Indian Ports Association
IPCL	Indian Petrochemicals Corporation Limited
IPL	Indian Potash Limited
IR	Indian Railways
IRR	Internal Rate of Return
IT	Information Technology
ITES	Information Technology Enabled Services
JBIC	Japanese Bank for International Co-operation
JNPT	Jawaharlal Nehru Port Trust
KG	Krishna Godavari
KRIBHCO	Krishak Bharati Cooperative
L&T	Larson & Toubro
LNG	Liquefied Natural Gas
LOA	Length Over All
LPG	Liquefied Petroleum Gas
MCA	Model Concession Agreements
MIS	Management Information System
MLD	Million Liter per Day
MMTC	Minerals and Mines Trading Corporation
MOSRTH	Ministry of Shipping, Road Transport and Highways
MOU	Memorandum of Understanding
MOEF	Ministry of Environment and Forest

Acronym	Description
MSEB	Maharashtra State Electricity Board
MT	Million Tonnes
MTOE	Million Tonnes of Oil Equivalent
MTPA	Million Tonnes Per Annum
MW	Mega Watt
NALCO	National Aluminium Company
NHAI	National Highways Authority of India
NHDP	National Highway Development Project
NIPCCO	Nizampatnam Industrial Port Complex Company
NMDC	National Mineral Development Corporation
NMDP	National Maritime Development Program
NOM	New Oil Mooring
NPV	Net Present Value
NSDP	Net State Domestic Product
NTPC	National Thermal Power Corporation
OB	Ore Berth
OECD	Organisation for Economic Cooperation and Development
OH	Outer Harbour
OHC	Ore Handling Complex
OMC	Orissa Mining Corporation
OSBD	Output per Ship Berth Day
OSTT	Offshore Tanker Terminal
PCR	Port Connectivity Road
PCS	Port Community System
PME	Periodical Maintenance Examination
POL	Petroleum Oil and Lube
POSCO	Pohang Steel Company
PPP	Public Private Partnership
PSP	Private Sector Participation
RCL	Rain Calcinations Limited
RFID	Radio Frequency Identification
RFP	Request For Proposal
RINL	Rashtriya Ispat Nigam Limited
RMG	Rotterdam Maritime Group
RMGC	Rail Mounted Gantry Cranes
RSP	Rourkela Steel Plant
RTGC	Rubber Tyre Gantry Cranes

Acronym	Description
SAIL	Steel Authority of India Limited
SBI	State Bank of India
SBM	Single Buoy Mooring
SECA	SOx Emission Control Areas
SEZ	Special Economic Zone
SKO	Super Kerosene Oil
SPV	Special Purpose Vehicle
STP	Sewage Treatment Pond
STS	Ship To Shore
SVRS	Special Voluntary Retirement Scheme
SWOT	Strength Weakness Opportunities Threat
TAMP	Tariff Authority for Major Ports
TCS	Tata Consultancy Services
TEU	Twenty Feet Equivalent Unit
TISCO	TATA Iron And Steel Company
TNEB	Tamilnadu Electricity Board
TPH	Tonnes Per Hour
TRT	Total Turnaround Time
UNEDIFCAT	United Nations Electronic Data Interchange For Administration Commerce and Transport
USD	United States Dollars
VCTPL	Visakha Container Terminal Private Limited
VLCC	Very Large Crude Carrier
VPT	Visakhapatnam Port Trust
VSPL	Vizag Seaport Private Limited
VTMS	Vessel Traffic Management System
WQ	West Quay
WTO	World Trade Organisation

1. INTRODUCTION

1.1 Background

Further economic development of India requires an efficient national transport system. The seaports are major components of that system; the bulk of the imports and exports (about 95%) are entering and leaving the country via its seaports. India has twelve major seaports and 185 minor seaports along a coastline of over 6,000 km. The twelve major ports (Paradip, Kolkata, Visakhapatnam, Ennore, Chennai, Tuticorin, Cochin, New Mangalore, Mormugao, Jawaharlal Nehru, Mumbai and Kandla; see figure below) handle about 75% of total Indian port traffic. The overall growth of India's port traffic is estimated at 10% per annum. Due to the foreseen national economic development in the coming decades, a strong further growth of the country's port traffic can be expected.

Figure 1-1 The Major and other Ports in India

The Ministry of Shipping, Road Transport and Highways (MOSRTH) has recently formulated a comprehensive National Maritime Development Programme (NMDP), which envisages various port capacity improvements and hinterland connectivity projects across the 12 major ports over a ten-year time frame. As part of the NMDP, MOSRTH has mandated that each of the twelve major ports should develop a business plan that:

- States a long-term vision for the port that builds on its core strengths;
- Establishes the goals to be achieved over the next seven years to satisfy this vision;
- Describes the strategy to be followed to achieve these goals;
- Provides a detailed plan of action to implement the strategy; and
- Identifies sources of financing for all proposed investments.

The business plan has also to provide the foundation for an annual planning process in order to be able to adjust it regularly to changing circumstances. Implementation of the plan is to be financed by private sector participation and internal Port Trust financial resources.

The specific objectives of the complete study are to deliver in 25 weeks time:

- The preparation of a business plan for the Visakhapatnam Port Trust that is in line with its competitive advantages and capabilities and can be implemented without government financial support;
- The preparation of a 20 years vision for the Port;
- The preparation of an Action Plan for the next 7 years detailing specific projects and activities to be undertaken; and
- The installation of a process for the monitoring and reporting of the progress in achieving results and provide the capability to annually update the plan to reflect changing circumstances.

The following phases will be undertaken to come to the formulation of the business plan:

1. The preparation of an inception report reporting the base line of the port;
2. An interim report containing a trade and traffic forecast for all commodities and cargo groups and the financial economic calculations based on the proposed investments;
3. A draft business plan
4. A final business plan

This report presents the draft business plan for the Visakhapatnam Port Trust.

1.2 Team of consultants

The character of the project required a multi-disciplinary approach. The team of consultants included therefore the following experts:

Mr. John Koppies MSc	Team leader and Port Economist
Dr. Henrik Stevens	Deputy Team Leader and Port Institutional Expert
Mr. Biju Lukachan	Project Management
Mr. Bart Winder MSc	Port operations expert
Mr. Sunil Bahtia	Port Tariff expert
Mr. Maarten van Mourik MSc	Financial-economic expert
Dr. D.J. Rao	Environmental expert
Mr. S.N. Srikanth	Expert Market Analysis
Mr. R. Muralidhar	Trade & traffic expert and market analysis
Mr. Yograj Kolhe	Hinterland connectivity expert and land use

In addition, a home office support team was available for data analysis.

The RMG/TCS team is very grateful to the excellent support provided by the VPT experts and especially the representatives of the mirror team, headed by Mr. Chairman Kishore and Ms. Y. Jayanthi.

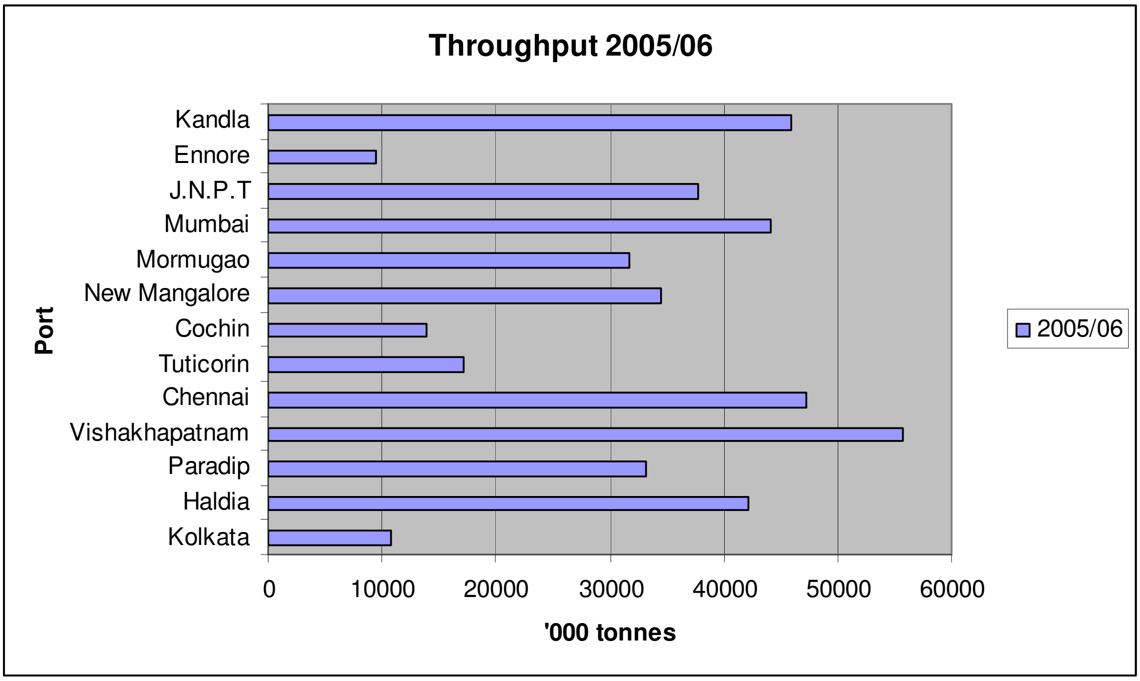
2. THE PORT OF VISAHAKAPATNAM

2.1 Location of the port

Visakhapatnam Port on the Indian East Coast located at 17^0 41’ N and 83^0 18’ E is almost equidistant from Kolkata and Chennai. The port is a premier Indian port in terms of annual traffic (cargo throughput). The port is a major bulk handling port with POL, Iron Ore and Coal being the major bulk commodities. Other commodities handled in substantial quantities are Iron & Steel, Fertilizers & Fertilizer Raw Materials and Alumina.

The port of Visakhapatnam has maintained its first national market position when it comes to throughput for the last six years and surpassed the mark of 55 million tons of cargo throughput in the year 2005-06 out of a total of 423.4 Mt for all major ports.

Figure 2-1 The throughput of the major ports (2005/06)



Map 2-1 Markets

Map 2.1 is illustrative of the captive and non-captive markets of Visakhapatnam port. It also shows other ports on the coast that could compete to share the markets with Visakhapatnam port.

While the captive and non-captive markets are serviced through road & rail connectivity, distant parts of the country like Gujarat and Maharashtra are catered to by Visakhapatnam port through the coastal shipping route. Some of the commodities are POL and Iron Ore.

Thermal Coal for the Tamilnadu Electricity Board (TNEB) is also shipped from Visakhapatnam by the coastal route.

Andhra Pradesh state, where the port is located, has a coast line of about 1014 km. Apart from Visakhapatnam port the state has other 12 existing minor ports out of which Kakinada is the most active deep water port with advanced facilities and handling large volumes of cargo. The private ports of Krishnapatnam and Gangavaram have also been given on lease by the state government and facilities are being developed and expected to become operational soon. These ports can cater to international as well as coastal traffic.

2.1.1 Port limits

The port limits and other details such as entrance channel and turning circle are as follows.

North: A line drawn from the stone marked 'VH' at the North-West corner of the S. No. 72 of Kapparada along the South Eastern Railway Boundary upto the Stone marked 'VH' at the North-East corner of S.No.61of Kapparada Village, thence along the boundary of the land acquired for the Visakhapatnam Harbour upto a stone marked 'VH' on the South side of the Railway crossing at the North-East corner of the Rose Hill, thence along the South side of the road lying North of Rose Hill to its termination on the North side of the back waters, thence along the North side of the back waters, thence along the sea beach to the boundary mark at Scandal point and thence along the sea beach upto Northern Toe of Kailasa Konda and thence along the line due East along 17˚ 45' Latitude line to 6 nautical miles East of and parallel to the ten fathom line of soundings.

East: 6 nautical miles East and parallel to the 10 fathom line of soundings.

South: From a point on the beach of Yarada village on a bearing 122˚ meeting the Eastern boundary 6 nautical miles East of and parallel to, the 10 fathom line of soundings which is 6 nautical miles, 7.3 cables on a bearing of 145˚ from Dolphin Nose Light House and thence along the shore and then along the old Dutch Battery, thence along the South side of the back waters and the foot of the Dolphin's Nose Hill to a stone marked 'PL' at the South East corner of the tank in S.No.33 of Malkapuram, thence to the stone marked 'VH' at the point where the Anakapalle road meets the diversion road to the ferry, thence along the North side of the Anakapalle road up to the 2nd mile stone.

West: A line drawn from the 2nd mile stone on the North side of the Anakapalle road in the North-Westerly direction to a stone marked 'PL' a the North Eastern corner of Santhametta, thence to a stone marked 'PL' at the foot of Bazaarmetta, thence along a straight line drawn to a stone marked 'VH' at the South West corner of S.No.86 of Kapparada, thence along the boundary of the land acquired for the Harbour up to the stone marked 'VH' at the North-West corner of S.No.72 of Kapparada village.

Note: Wherever any boundary specified above lies along the shore of the sea or the back waters, the boundary line shall be at a distance of 46 m above high water mark at ordinary spring tides.

Geographical limits of the port:
17˚45'00"N, 083˚21'08.5"E
17˚45'00"N, 083˚30'21.24"E
17˚34'55.02"N, 083˚21'54.51"E
17˚38'34.83"N, 083˚15'38.25"E

Table 2-1 Port Limits and Other Details

Location		Entrance Channel			Turning Circle		Type
Latitude	Longitude	Length (m)	Min. Depth (m)	Min. Width (m)	No.	Diameter (m)	of Dock/Port
17^0 41'	83^0 17'	1.7 (OC)	-20.0	200.0	1	610 (OHTB)	--
		1.62 (IC)	-10.7	97.5	2	365.75 (IHTB)	--

2.2 The commodities handled

2.2.1 The throughput 1995-2006

Total throughput of Visakhapatnam port has risen by around 80% between 1994-95 and 2005-06. Half this growth has been in Iron Ore exports. In the last few years, POL cargoes have fallen somewhat from the 2001 peak, whereas Fertiliser has picked up again. Thermal coal has been halved since 2000 and is now reached 1994 levels. Coking coal has moderately increased. In the Category "Others", the Steam coal, which in 2005-06 accounted for nearly 2 MT.

Table 2-2 VPT throughput, 1995-96 to 2006, Mt/year

	POL	Iron ORE	Fertilizer	Thermal Coal	Coking Coal	Container	Others	Total
1995-96	12.5	5.7	2.0	3.0	5.1	0.1	4.4	32.8
2000-01	18.3	9.3	1.5	5.4	4.7	0.3	5.2	44.7
2001-02	18.6	9.2	1.7	3.9	5.7	0.3	5.0	44.3
2002-03	16.9	10.4	1.3	3.2	6.3	0.3	7.5	46.0
2003-04	17.4	12.4	1.5	2.5	6.1	0.3	7.6	47.7
2004-05	14.6	16.6	2.1	2.5	6.5	0.6	7.2	50.1
2005-06	16.9	15.9	3.2	2.7	7.1	0.6	9.1	55.3
2005-06 (VPT)	16.9	16.0	3.2	2.7	7.5	0.6	8.8	55.8

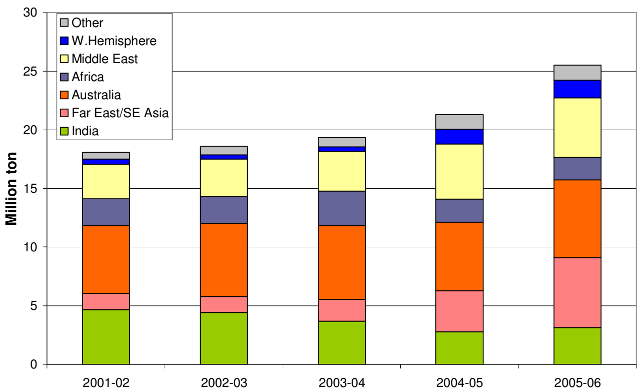
Sources: IPA and 11^{th} Plan, 2005-06 VPT published numbers

The Ministry of Shipping has set targets for Visakhapatnam for the year 2013-14, which indicated that Visakhapatnam port is to grow by another 80%, or approximately 8% annually. Most of that growth is to come from POL related traffic, as well as Thermal coal. The growth in the previous ten years was an average of around 4.5% per year. As such, the target implies a near doubling of the growth rates. Much of that increase is dependent on the realisation of several individual large projects by large companies. In the traffic forecast, these main projects will be discussed. Delays in large projects are common, especially when no firm monetary commitment has yet been made. In addition, with the envisaged large increases in output over the coming Plan period, it is likely that many firms will be seeking similar services. This typically leads to cost overruns and further delays.

2.2.2 Throughput by region

The main country of origin for the imports of coal is Australia and accounts for around 25% of the total imports. Imports from the Middle East have risen to nearly 5 Mt from 3 Mt, and now account for around 20% of imports. Main products are crude oil and fertilisers. Imports from Far East/SE Asia have risen rapidly. This region is in fact confined to Malaysia for Oil Products (nearly 1 Mt), China for Metallurgical Coke (0.5 Mt) and to a lesser extent Steam Coal from Indonesia (0.3 Mt in 2004-05). Imports from other areas in India have dropped sharply to below 3.0 Mt in 2004-05, due almost entirely to lower shipments of POL from the West of India.

Figure 2-2 VPT imports by origin, 2002-2006 (in Mt)

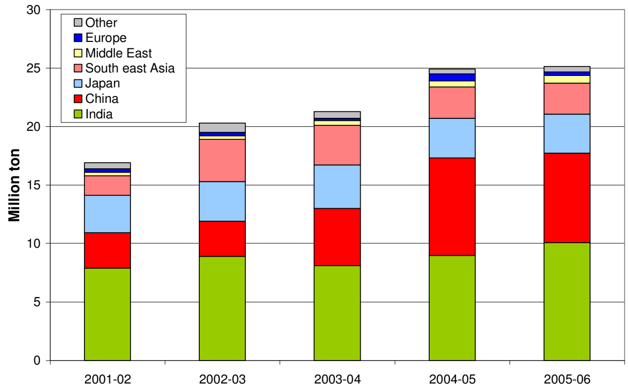


Source: Data provided by VPT, compilation by consultant

Export destinations are much focussed. Overseas exports are to Japan, which has taken a stable 3.5 Mt of Iron Ore for the past few years. China has rapidly risen as an export destination, rising to nearly 8.5 Mt in 2004-05. The products are Iron Ore (7.0 Mt), Iron Ore Pellets (0.3 Mt) as well as Alumina (0.7 Mt). Exports to other Far East/S.E. Asia destinations dropped below 3.0 Mt in 2004-05. The largest export destination is Singapore, taking 1 Mt, of which 0.7 Mt is POL and 0.3 Mt is containerised cargo. Bangladesh takes 0.6 Mt, of which 0.4 Mt Blast Furnace Slag.

Other ports in India are the dominant export destination for Visakhapatnam, with Chennai taking 2.7 Mt of Thermal Coal, Mumbai taking 2.1 Mt, of which 1.9 Mt of Iron Ore, and Hazira taking 3.5 Mt, of which 1 Mt of Iron Ore and 2.5 Mt of Iron Ore Pellets.

Figure 2-3 VPT exports by destination 2002-2006 (in Mt)



Source: Data provided by VPT, compilation by consultant

Summarised, the current sea-side Origin and Destination indicates following trends:

Table 2-3 Overseas and coastal traffic, 2001-02 to 2005-06, Mt

	2001-02	2002-03	2003-04	2004-05	2005-06
Overseas imports	13.4	14.2	15.7	18.5	22.4
Overseas exports	9.0	11.4	13.3	15.9	15.1
Overseas total	***22.5***	***25.6***	***29.0***	***34.5***	***37.5***
Coastal imports	4.7	4.4	3.7	2.8	3.1
Coastal exports	7.9	8.9	8.1	9.0	10.1
Coastal total	***12.5***	***13.4***	***11.8***	***11.8***	***13.2***
Total traffic	**35.0**	**38.9**	**40.7**	**46.2**	**50.6**
Imports Coastal share %	26%	24%	19%	13%	12%
Exports Coastal share %	47%	44%	38%	36%	14%
Total Coastal share %	36%	34%	29%	26%	40%

Source: Data provided by VPT, consultants' calculations. Data excludes transhipment (equal to 5.2 MT)

Two features underlie these trends. The first is the rapid growth of Iron Ore exports to China. These have risen from 1.6 Mt in 2002-03 to 7 Mt in 2004-05, before falling back by around 1 Mt in 2005-06. Secondly, there has been a marked shift in coastwise exports to the West of India. Exports of Iron Ore/ Pellets to Hazira and Mumbai have increased from 2.7 Mt in 2002-03 to 5.4 Mt in 2004-05, while exports to Magdalla have nearly ceased.

The following chart illustrates the main commodity flows by origin and destination for the year 2005-06.

Map 2-2 Main cargoes by origin and destination, 2005-06

Source: Data provided by VPT, compilation by consultant;
Note: thickness of line indicates relative flow volume

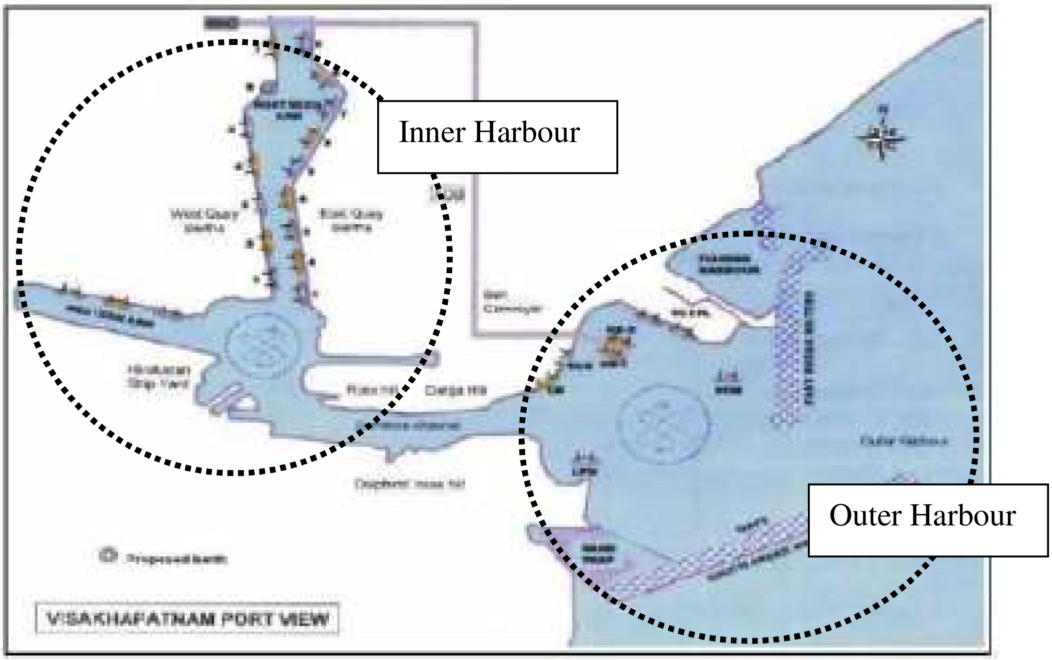
2.3 Port infrastructure

2.3.1 Basic infrastructure

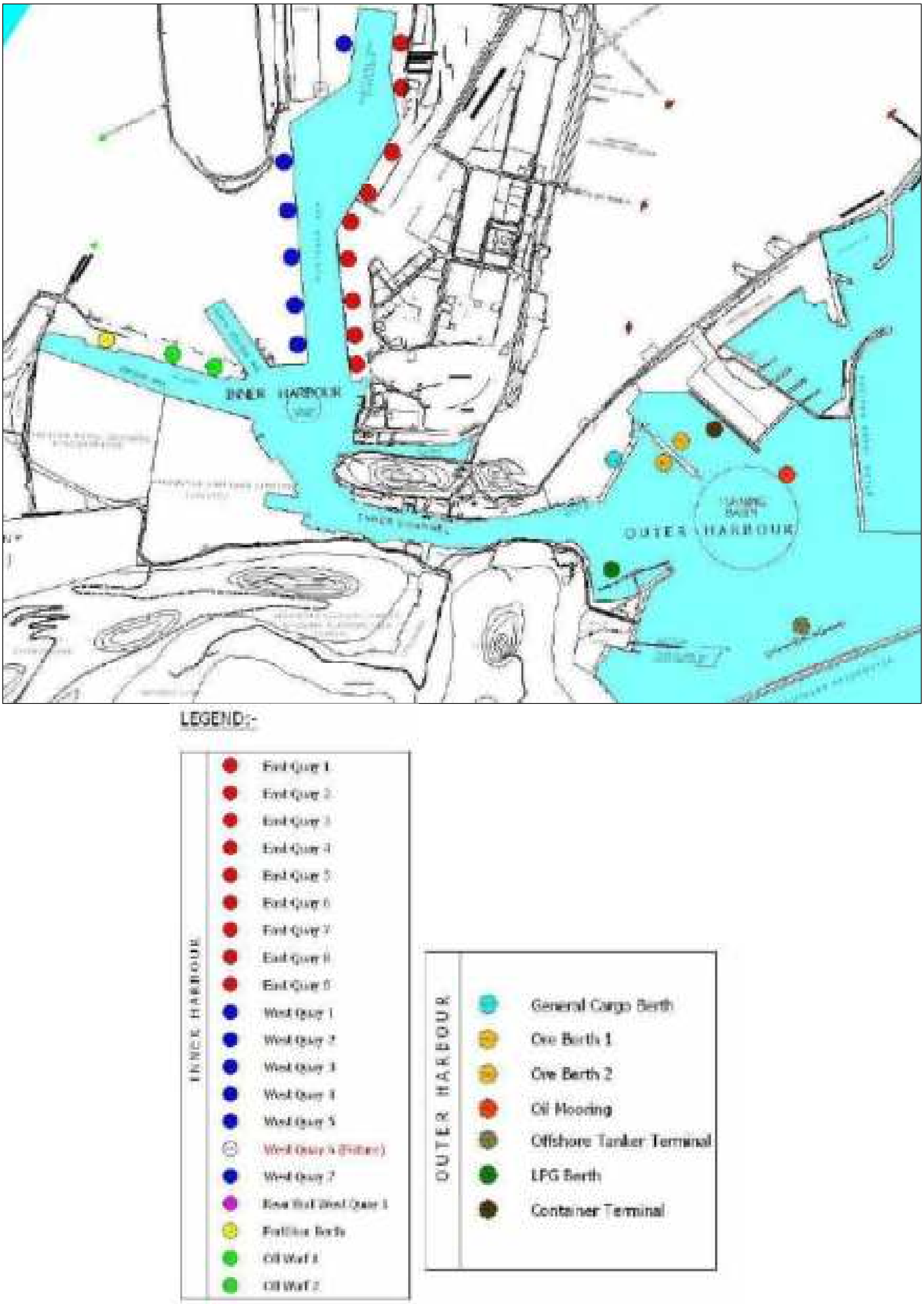
The port located on the East Coast of India includes 2 harbours viz. the Outer Harbour with 6 berths, one mooring, and the Inner Harbour with 18 berths and 1 mooring. The following map below shows the general port layout and inner/outer harbour berths. The distribution of berths is as follows:
The outer harbour consists of 7 berths:

- 2 Ore berths (finger jetty)
- 1General cargo berth
- 1 Offshore Tanker Terminal (OSTT)
- 1 LPG jetty
- 1 container berth (Visakha Container Terminal Private Limited - VCTPL)
- New Oil Mooring

Map 2-3 Location of berths in Visakhapatnam



Map 2-4 Port Lay-Out



2.3.2 Terminals Inner harbour

The inner harbour of the port has been functioning since 1933 and consists of the naturally protected entrance channel, a turning basin and three navigable arms. It consists of two basins in use by the VPT, the northern basin and the western basin. The northern basin is predominately used for coal, fertilizers, food grains, fertilizer raw materials, illuminate sand and general cargo such steel products. The western basin is used for Fertilizer Raw materials, Food grains, sand and other bulk/break bulk cargo. Both basins have limited draft of 10.2 m, which is sufficient for ships up to 45,000 DWT.

The access channel to the inner port is relatively narrow. At the smallest section only 110 m wide, with a rocky coastline. Due to the dimensions of the channel navigational restrictions apply. Only one-way traffic is possible and at night the allowable ship size is further reduced. Dredging works to widen the channel are ongoing.

Table 2-4 Operations inner port

Berth	LOA (m)	Draft (m)	Cargo	Year of Commencement	Equipment Available
EQ 1	167	10	Bulk/general cargo, timber, iron & steel	19-12-1933	4 Nos. 15 T
EQ 2	167	10	Bulk/general cargo, timber, iron & steel	19-12-1933	4 Nos. 10 T
EQ 3	167	10	Bulk/general cargo, timber, iron & steel	19-12-1933	4 Nos. 10 T
EQ 4	234	10	Bulk/general cargo, timber, iron & steel	01-07-1955	4 Nos. 15 T
EQ 5	167	10	Bulk/general cargo, timber, iron & steel	05-03-1968	2 Nos. 15 T
EQ 6	167	10.2	Bulk/general cargo, timber, iron & steel	06-11-1066	3 Nos. 10 T
EQ 7	182	10.2	Bulk/general cargo, timber, iron & steel	30-07-1995	4 Nos. 20 T
EQ 8	255	10	Multi-purpose, 2 x 100t mobile cranes	1-12-2004	2 Nos. 100 T
EQ 9	255	10	Multi-purpose	16-09-2005	-
WQ 1	160	10.2	Bulk/general cargo, timber, heavy lift, iron & steel	21-05-1994 (Jetty converted into quay berth)	-
WQ 2	214	10.2	Coking/thermal coal, limestone, other bulk cargo	02-08-1992 (Jetty converted into quay berth)	-
WQ 3	214	10.2	Coking/thermal coal, limestone, other bulk cargo	31-07-1992 (Jetty converted into quay berth)	-
WQ 4	220	10.2	Coking/thermal coal, alumina, caustic/coking soda	16-12-1965	-
WQ 5	220	10.2	Coking/thermal coal, alumina, caustic/coking soda	20-08-1965	-
WQ 7	255	10	Alumina, caustic soda, max 45,000DWT	29-07-2005	-
RE WQ-1	170	8	-	-	-
OR 1	183	10	Petroleum products, LPG and bunkering.	25-01-1957	-
OR 2	183	9.7	Max LOA 195m at one of the two berths.	18-10-1957	-
FB	167	10	Sulphur, rock phosphate and fertiliser	15-05-1967	-

The cargo handling operations in the inner port of Visakhapatnam are performed in several different ways. The main cargo handled is coal, alumina, fertilizers and general cargo such as steel products. The table below illustrates the different commodities handled in the inner port, including how and by whom they are being handled.

Table 2-5 Commodities handled inner port

Cargo	Import / Export	Handled at Berth	Arrives / Leaves Berth with	Handled with Equipment to / from Berth	Handled with Equipment to / from Ship	Handled by Whom	Loading / Discharge Rate T/Hr	Average Ship Size DWT	Average Parcel Size in Tons	Quantity per year in million tons
INNER PORT										
Thermal Coal	Export	WQ1-4	Trucks	Payloaders	Shipgear	private	200 t/hr per crane	45,675	33,500	2.7
Steel Products	Export	EQ1-4	Trucks	Wharfcranes	Wharfcranes Shipgear	VPT	varies	11,697	11,500	0.6
Calcined Pet Coke	Export	WQ1-4	Trucks	Payloaders	Shipgear	RCL	200 t/hr per crane	45,675	20,261	0.5
LAM & Pet Coke	Import	WQ1-4	Trucks	Payloaders	Shipgear	private	200 t/hr per crane	45,675	22,500	1.1
Feertilizer	Import	FB	Belt Conveyor	Belt Conveyor	Shipunloader	private	1500 t / hr	36,882	27,000	0.9
Coking Coal	Import	WQ1-4	Trucks	Payloaders	Shipgear	private	200 t/hr per crane	54,982	36,000	3.3
Steam Coal	Import	WQ1-4	Trucks	Payloaders	Shipgear	private	200 t/hr per crane	45,675	41,476	1
Alumina	Export	WQ5	Belt Conveyor	Belt Conveyor	Shiploader	private	1500 T /hr	38,026	30,000	1
POL	Export	OR-1	Pipe line	Pipe line	Pipe	private	5000 T/ hr	38,101	20,000	2.2
	Import	Or-2	Pipe line	Rail	Pipe	private	5000 T/ hr	28,678	10,500	1

Thermal Coal (Export)

Thermal Coal in the inner port is predominately handled at berths WQ1 – WQ4. Sometimes berths EQ 8 and 9 are used as well. The product is exported to Indian cities and considered as coastal transport. The product arrives by train from Brajrajnagar and Belphar, about 700km from the port. The trains (rake) transport 3500 ton per rake divided over about 58 wagons. The trains are transported to the port by locomotives operated by the rail authorities to a marshalling yard outside the port area. At this location the locomotives owned and operated by the port bring the trains into the port area to the unloading area.

Each rake is unloaded by labour via the side doors of the train. About 270 workers are needed to discharge a rake in 3 hours. The coal is further transported by payloaders and trucks to either the storage area or directly to the berths. The coal storage is located at various locations in the port and piles are created by pay loaders. Trucks transport the coal to the berths. The trucks dump the coal on mats attached by ropes (slings) to the gear of the vessels and material which is spilled next to the mats is cleaned by payloaders and man power. The ship gear is used for loading the ships at a rate of about 200 ton per hr per gang (Crane).

Picture 2-1

Thermal coal handling at West Quay berths

Coking Coal (Import)

Coking Coal in the inner port is predominately handled at berths WQ1 – WQ4. Sometimes it is handled first at the General Cargo Berth (GCB located in the outer harbour to reduce the draft of the ships to allow them to enter the inner port. The product is imported from a.o. Australia, China, New Zealand, Russia and the USA.

The coal is unloaded by ship gear since no cranes are available at the west berths. The coal is dumped on the quay wall and transported by pay loaders to the train. The trains are located on the berths are loaded with these pay loaders as well. The coking coal is transported to the near by steel factories at Andhra Pradesh and Chattisgarh.

Steam Coal (Import)

Steam Coal in the inner port is predominately handled at berths WQ1 – WQ4. Sometimes it is handled first at the GCB located in the outer harbour to reduce the draft of the ships to allow them to enter the inner port. The coal is handled the same way the coking coal is handled. Steam coal is imported from the mines in Bhutan, China and Indonesia and is transported by train to the hinterland to various steel factories in Andhra Pradesh and neighbouring states.

LAM & Pet Coke (Import)

LAM & Pet Coke in the inner port is predominately handled at berths WQ1 – WQ4, the same way as coking coal. The product arrives from the Middle East and Far East, such as Malaysia and Singapore and transported to the hinterland to various steel factories in the state and neighbouring states in India.

CP Coke (Export)

Calcined Pet Coke in the inner port is predominately handled at berths WQ1 – WQ4. Sometimes berths EQ 8 and 9 are used as well. The product is exported to countries like Indonesia, South Africa, Brazil, UAE, Venezuela, Jamaica and so forth. The handling is similar to the handling of the thermal coal.

Steel Products (Export)

Steel Products in the inner port are handled at berths EQ1 – EQ7. The products, mostly from Bhilai arrive by trucks directly from the factory about 500 km from the port. Loading of the relatively small vessels is done with the electrical wharf cranes, which are operated by employees of VPT. The steel products are often loaded to the ships directly from the trucks. The products are a variety of steel goods, such as wired steel coils, steel beams, reinforcements etc. are exported all over the world.

POL (Export)

POL in the inner port is handled at berths OR1 – OR2, located in the western arm of the port and also at LPG jetty of Outer Harbour. The products are loaded to the ships with loading arms. During the loading of the products, a protection floating ring around the ships prevents spillage of the product to the rest of the port. The products are transport form the nearby refinery by pipe lines to the berths and exported to Singapore, South Africa, UAE, and several locations in India.

Fertilizer (import)

The fertilizer in bulk is imported through the dedicated fertilizer berth (FB) located in the western arm of the inner port. The equipment on this berth is owned and operated by a private operator. The product is unloaded with a ship unloader and transported to the storage silo by a belt conveyor. The Fertilizers are imported from Australia, various countries in the M.E., China and South Africa. The fertilizers are transported from the storage silo to various locations in the state (A.P.) and other adjacent states.

Alumina (Export)

Alumina originates by train from Orissa and is unloaded by a train tippler and transported by a belt conveyor to the silos in the port. At berth WQ5 located in the northern arm of the inner port, the alumina is loaded to ships. The equipment is owned and operated by a private operator. Transport from the silos to the berths is done with a belt conveyor which ends in a tripper to the ship loader. The product is exported to China and Russia.

2.3.3 Terminals Outer harbour

The outer harbour has a protected basin of about 200 hectares. It has two breakwaters, 3 km long on the eastern and southern breakwaters. The products which are handled here are coal, iron ore, containers, crude LPG and other POL. The draft in the outer basin is maximum 17-18 m which various water depths along the berths. Bottlenecks in the outer port are the limitation of space between the two breakwaters. At the moment, crude ships already experience navigational restrictions. Berthing is restricted to day operations only. Due to limited space in the outer port, tankers can not be moved during the night.

Table 2-6 Key features of the terminals in the Outer Port

Berth	LOA(m)	Draft (m)	Cargo	Year of Commencement	Equipment available
OB 1 & 2	270	16.5	Iron ore	Dec. 1976	Shiploader 8000 t/hr
NOM	270	15	Transhipment of POL	24-10-1982	-
GCB	280	14.5	Coking coal and bulk cargoes	23-03-1985	Floating cranes
OSTT	280	17.0-17.30	Crude oil, up to draught 17.3m on rising tide.	Nov. 1985	Loading arms (5000 t/hr)
LPG	280	13	LPG	31-08-2000	Loading arms (250 t/hr)
Container Terminal	449	15	Containers	26-06-2003	STS

The cargo handling operations in the outer port of Visakhapatnam are performed in several different ways. The main cargo handled is coal, iron ore, and liquids such as crude, POL and LPG. The operational aspects in this report will be focused on these products only since it will form the majority of all cargo handled in the inner port. The operations will be described for both the import and export flow at their specific locations. An overview of the operations is presented in the table hereafter:

Table 2-7 Overview of operations

Cargo	Import / Export	Handled at Berth	Arrives / Leaves Berth with	Handled with Equipment to / from Berth	Handled with Equipment to / from Ship	Handled by Whom	Loading / Discharge Rate T/Hr	Average Ship Size DWT	Average Parcel Size in Tons	Quantity per year
OUTER PORT										
Coking Coal	Import	GCB	Rail wagons	Payloaders + Trucks	Shipgear Floating cranes (Figee)	private	various	41,476	36,000	3.7
Steam Coal	Import	GCB	Rail wagons	Payloaders + Trucks	Shipgear Floating cranes (Figee)	private	various	41,476	41,500	0.7
Iron ore (fines)	Export	OB1-2	Conveyor belt	Conveyor belt	Shiploader	VPT	4000 t/hr	64,000	61,500	11.0
Iron ore (pellets)	Export	OB1-2	Conveyor belt	Conveyor belt	Shiploader	VPT	4000 t/hr	93,640	61,500	2.7
Crude	Import	OSTT	Pipe line	Pipeline	Loading arm	Oil Co	5000 t/hr	97,064	80,000	7.5
LPG	Import	LPG	Pipe line	Pipeline	Loading arm	Oil Co	250 t/hr	14,788	6,000	0.3
POL	Export	OM	Ship	Pipeline	Pipeline	Oil Co	5000 t/hr	37,469	20,000	0.7

Coking Coal and Steam Coal (Import)

Coking Coal and Steam Coal in the outer port are handled (Picture 7.2) at the General Cargo Berth. The coal is imported from a.o. Australia, China, New Zealand, Russia and the USA. Ships are either discharged by its own ships gear or by two floating cranes. The operations are done by private stevedores. The floating cranes are owned and operated by the private operator.

Picture 2-2 Coking coal and steam coal handling

The coal is dumped on apron by the cranes and transported to the storage yard directly behind the quay by dump trucks. A train loading station is located near the GCB and loading of the trains with coals is done with pay loaders. The product is transported to Andhra Pradesh and Chattisgarh by trains.

Iron Ore (Export)

Picture 2-3 Iron ore loading

Iron ore is exported in various forms, e.g. fines and pellets. These products are handled the same way at the dedicated iron ore berths OB-1 and OB-2. The iron ore arrives by train from the mines about 480km from the port area. Two wagon tipplers in the port unload the rakes (3500 ton per rake). A maximum of about 16 trains per day can be handled. The capacity of the tipplers is about 25 tips per hour. The product is transported by a system of belt conveyors to the stacking yard. A separated conveyor brings some product to the pellet factory. The pellets from this factory are transported back to the stacking yard by a belt conveyor. The entire stacking yard consists of 5 stacks and the product is stacked by two stackers and reclaimed by three bucket wheel reclaimers. The reclaiming capacity of each reclaimer is 4000 t/hr. A 8000 t/hr overhead belt conveyor with a length of about 5km transports the products from the stacking yard to the iron ore jetty. The iron ore jetty has two berths but only one ship loader and hence only one ship at the time can be loaded. The design capacity of the ship loader is 8000 ton per hour but only loading rates between 4000 and 4500 t/hr are normally achieved. The reason that lower rates are used is the maximum reclaiming capacity at the stacking yard. Only one reclaimer at the time is used due to various clients and various products stored.

Crude (Import

Picture 2-4 Crude oil handling

Crude is unloaded at the offshore tanker terminal at the outer port and pumped to the refinery by a pipe line. Unloading rate is 5500 ton per hr. Berthing is restricted to day operations only. Due to limited space in the outer port, tankers can not be moved during the night. The crude arrives from the Middle East and is used in the near by HPCL Refinery.

LPG (Import)

Picture 2-5 LPG handling

LPG is handled at the LPG berth and unloaded with a rate of 250 ton per hr. There is a direct pipeline to HPCL refinery. The LPG is imported from the Middle East and Far East.

2.4 Port capacity analysis

The loading and discharge rates to and from vessels in both the inner and outer harbour have been analysed using the data as received by the VPT (administration reports 2004-2005, and the port view 2005-2006 which was handed over on 30-10-06).

The rates in these data were defined as average output per ship per berth day. It is calculated as the total amount of loaded / discharged cargo divided by the total amount of time the vessel is at the berth. This implies that actual rates are higher since berthing and deberthing time is included. The table hereafter shows the rates for the grouped cargo divided into export and import for the years 2004-2005 and 2005-2006.

Table 2-8 The capacity of the Port, export commodities, 2004-2006

		Cargo handled Mt		Average ship size '000 DWT		Average output per ship berth day ('000 ton)	
		2004/05 *A	2005/06 *B	2004/05	2005/06	2004/05	2005/06
I.A	Iron Ore (fines)	13.5	12.9	68.2	69.8	45.1	37.8
I.B	Iron ore (pellets)	3.1	3.0	93.6	93.6	49. 5	43.6
II	Steel & Pig Iron	0.3	0.6	17.1	11.7	1.9	1.7
III.A	Thermal Coal	2.5	2.7	46.6	45.7	10.6	9.7
III.B	Alumina	0.9	0.9	38.0	38.0	20.4	19.8
III.C	Calcined Coke	0.2	0.4	40.3	41.3	5.8	5.2
III.D	Other Dry Bulk	2.0	1.6	41.3	41.3	5.8	5.2
IV	Other General Cargo	0.4	0.3	19.3	18.3	1.7	1.7
V.A	POL	1.7	2.3	33.2	34.4	10.0	10.3
V.B	Liquid Bulk		0.0	20.5	19.6	6.4	6.3
VI	Containers	0.4	0.4	17.4	17.8	9.7	8.1
	Total	**25.1**	**25.1**				

Table 2-9 The capacity of the Port, import commodities, 2004-2006

		Cargo handled Mt		Average ship size '000 DWT		Average output per ship berth day ('000 ton)	
		2004-2005 *A	2005-2006 *B	2004-2005	2005-2006 *B	2004-2005	2005-2006*B
I.A	Fertilizers	2.0	2.3	35.9	36.8	4.5	4.5
I.B	FRM		0.9	32.9	36.7	5.1	5.5
II	Food Grains						
III.A	Coking Coal	6.5	7.1	54.6	54.9	11.6	10.3
III.B	P Coke	0.5	0.8	40.3	41.3	5.8	5.2
III.C	MET Coke	0.7	0.5	40.3	41,.3	5.8	5.2
III.D	Steam Coal		1.9	40.3	41.3	11.6	10.3
III.E	Other Dry Bulk	1.4	1.3	29.4	30,.1	5.8	5.2
IV	Other General Cargo	0.3	0.4	17.6	16.8	1.2	1.2
V.A	Crude	8.9	7.5	115.1	97.1	67.5	58.6
V.B	POL		1.9	33.2	34.4	6.1	6.8
VI	Other Liquids	0.7	0.8	20.5	19.6	6.4	6.3
VII	Containers	0.3	0.3	17.4	17.8	9.7	8.1
	Total	21.3	25.5	96.4	98.7	9.8	13.1
	Transhipment	3.9	5.1				

Note: *A Data 2004-2005 from admin report 2004-2005; *B Data 2005-2006 from Port View document 2005-2006

60% of the cargoes are handled in the Outer Harbour, while 40% is handled in the Inner Harbour. A small share is handled at the Anchorage. Throughput in the Inner Harbour is focused on the West Quays 1-4, handling a third of all IH cargo or 8.3 Mt, while the nine East Quay berths handle 7.1 Mt. WQ 5-7 handles 2.7 Mt, the captive FB handles around 0.9 Mt and the OR-berths handle 3.3 Mt. The OSTT handles over 8 Mt, or just over a quarter of all throughputs. Transhipment takes place both on the OSTT and the Oil Mooring. The General Cargo Berth handles 5 Mt.

The present cargo handling capacity is determined with the rates of 2005-2006 and the maximum acceptable berth occupancies as determined by the government. The available number of days is determined as 330 per year.

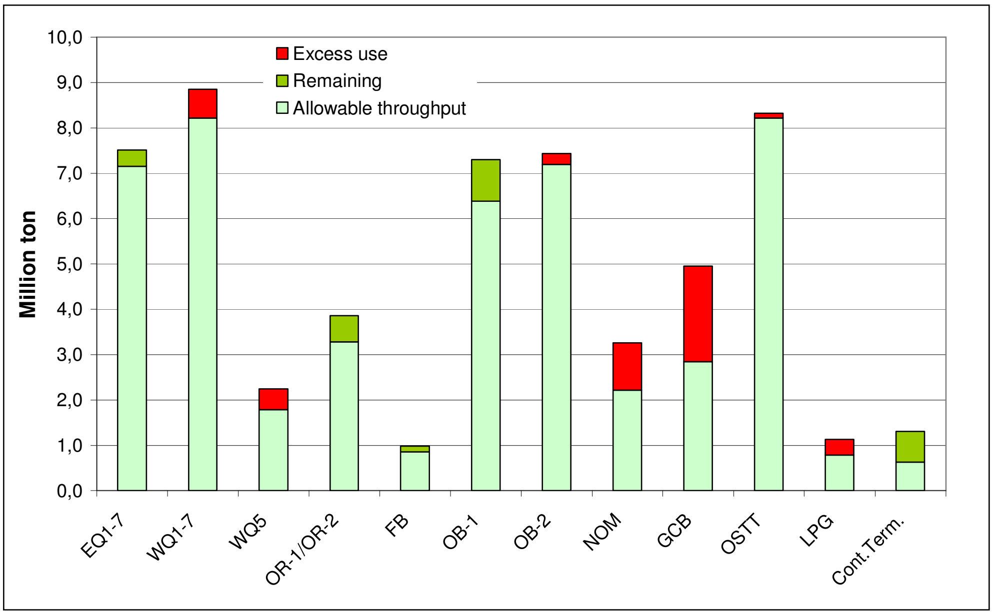
The inner port has space for more cargo while the outer port is handling almost the maximum allowable volumes. In case the allowable berth occupancies, the amount of cargo which can be handled is about 58 million ton per year which is 5 % more than was handled in 2005-2006. It should be noted that is only due to the remaining space at the inner port and additional room at the iron-ore berth.

The liquids berths have exceeded the maximum allowable occupancy resulting in additional waiting times for the vessels. They handled in 2005-2006 about 12.7 million ton of cargo. The maximum allowable capacity is 12.3 million ton. The General Cargo Berth is heavily overused. A percentage of

104% means that the facility is occupied for more than 330 days. In 2005-2006 about 5 million ton of cargo was handled, while the maximum allowable throughput is only 3 million ton.

The chart below summarises the remaining capacity, or the "excess" use with its implications on waiting time as indicated in the previous section.

Figure 2-4 Capacity use by berth group, 2005-06



2.5 Berth occupancies / ships TRT

2.5.1 General

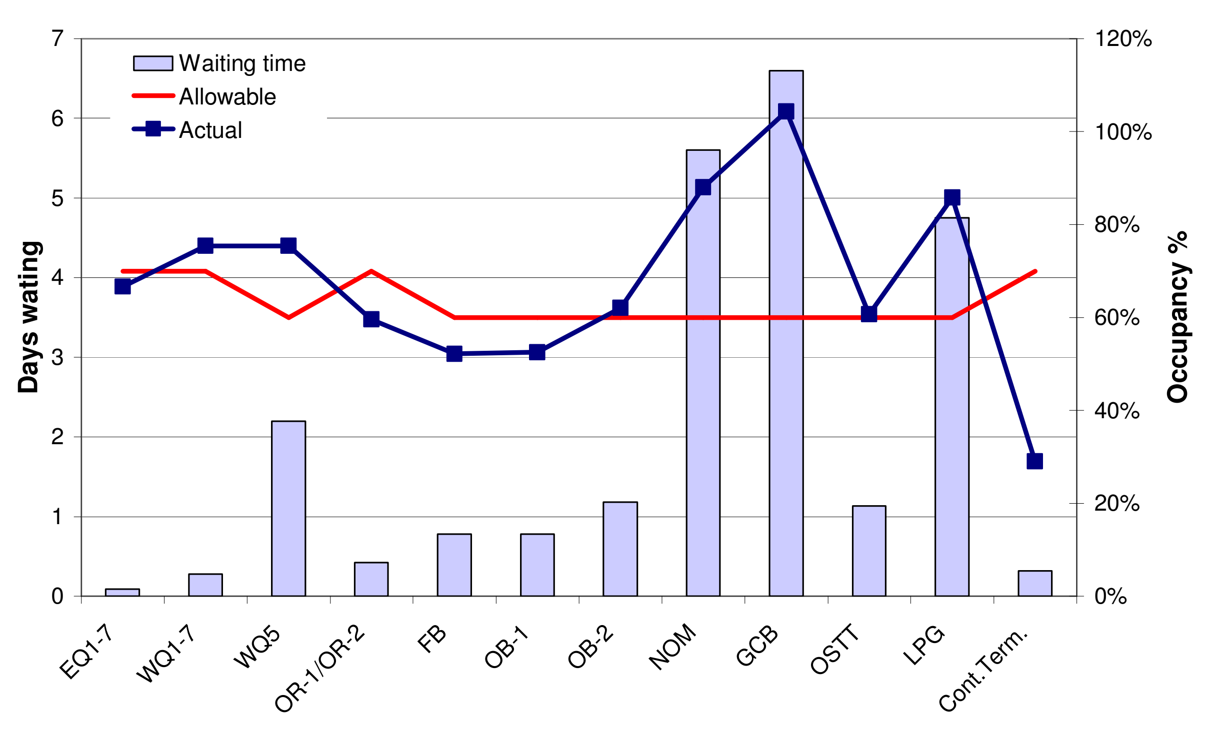
The berth occupancies have been calculated by the consultants, using the data as indicated in the previous section. For the calculations the total amount of available berth days per year of 330 has been applied. Included in the total berth time is the sailing time from and to the anchorage, which is calculated from the administration reports data since it was not explicitly mentioned.

2.5.2 Berth Occupancy in 2005-2006

The total berth occupancy for the inner harbour was 68% while the occupancy for the outer harbour excluding the container terminal was 76%.

The following chart gives the allowable occupancy as per the guidelines versus the actually observed occupancy and the implied waiting time in days. It is clear that the utilisation has risen to such levels at a number of berths, that waiting times have now increased to more than 6 days.

Figure 2-5 Occupancy and implied waiting time, 2005-06



It can be concluded that the port has reached its maximum capacity in case the situation will remain as it is. The liquids berths have exceeded the maximum allowable occupancy resulting in additional waiting times for the vessels. The General Cargo Berth is heavily overused. A percentage of 104% means that the facility is occupied for more than 330 days.

The liquid berths in the outer harbour handled in 2005-2006 about 12.7 million ton of cargo. The maximum allowable capacity is 12.3 million ton. The General Cargo Berth handled in 2005-2006 about 5 million ton of cargo while the maximum allowable throughput is only 3 million ton.

2.5.3 Ships TRT

The total round time for ships is defined as the moment the ship passes the anchorage, sailing to the berth, berth time, sailing to the anchorage till the moment it passes the anchorage. The waiting time at the anchorage is given in the reports by the VPT as an average value for different commodity groups. The average TRT for the export cargo is 3.9 days, while the TRT for the import cargo is 4.4 days. The average TRT for cargo groups by the VPT were only available for the years 2004-2005 are presented in the table below.

Table 2-10 Average Turn-around-Time 2005-06 (in days)

Cargo group	TRT in days
Containers	0.55
Break Bulk	4.76
Dry bulk mechanized	3.54
Dry bulk conventional	5.67
Liquid bulk	2.40

2.6 Land use

The port of Visakhapatnam has a huge land area (4,368 ha). The table below provides the distribution of this land according to its existing use.

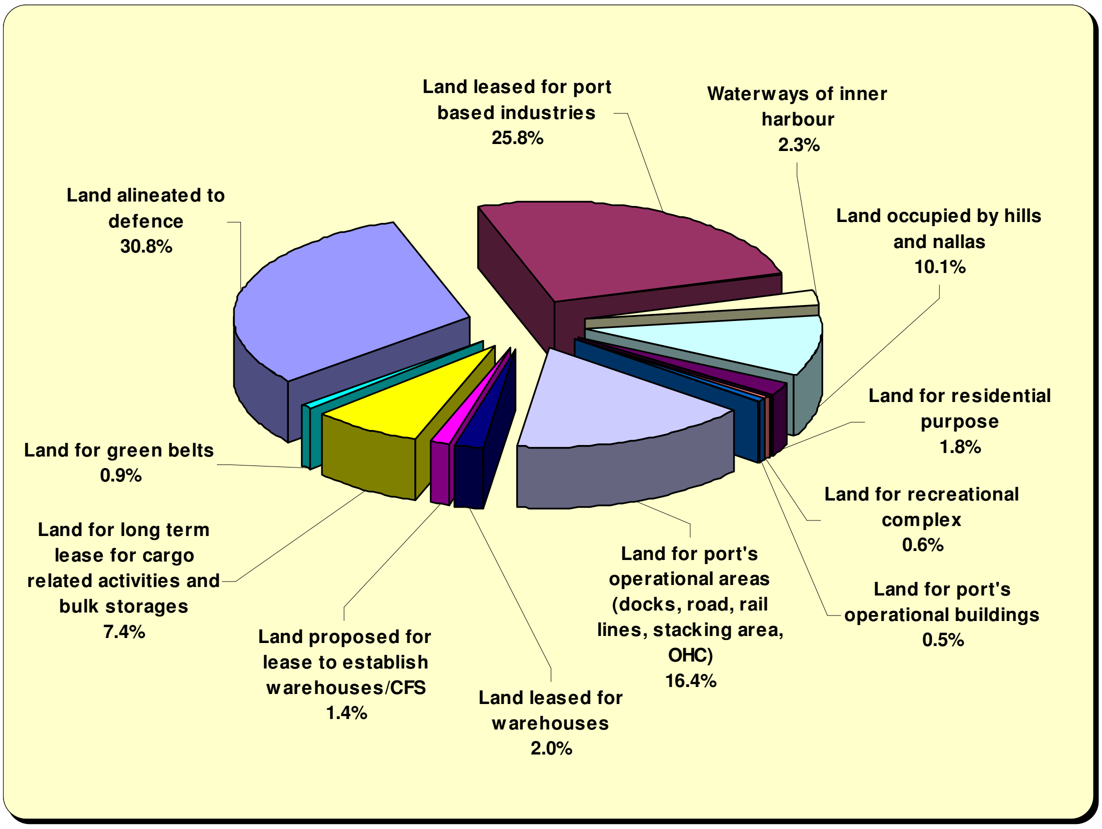
Table 2-11 Details of the major break up of Port land and Land Use of VPT (in Acres)

Land use	Hectares (Ha)	Percentage
Land alienated to defence	1,345	30.8%
Land leased for port based industries	1128	25.8%
Waterways of inner harbour	101	2.3%
Land occupied by hills and nallas	441	10.1%
Land for residential purpose	80	1.8%
Land for recreational complex	26	0.6%
Land for port's operational buildings	20	0.5%
Land for port's operational areas (docks, road, rail lines, stacking area, OHC)	716	16.4%
Land leased for warehouses	87	2.0%
Land proposed for lease to establish warehouses/CFS	60	1.4%
Land for long term lease for cargo related activities and bulk storages	324	7.4%
Land for green belts	40	0.9%
Land acquired by VPT	4,368	100%

The existing land use has limited land for operational activities and lot of administrative and other buildings It can be seen from the table that about one third (30.8%) of the land is alienated for the defence related activities. Nearly one fourth (25.8 %) of the land is leased for port based industries. Substantial portion of the land is occupied by hills and nallas which poses problem for development. The land dedicated for the port's core operations such as docks, stacking area, OHC, roads, rail system is about 716 ha (16.4%) with green belts occupies about slightly less then one percent of the land.

The residential area around the old town adjacent to the outer harbour of the port is a major hindrance to the expansion plans of the port. The movement of cargo from and to the outer harbour has to be through a round about way to avoid movement of heavy vehicles in the city. One of the major problems faced by the residents of the areas close to the port is of pollution due to handling of coal/iron ore etc. In order to mitigate the air pollution, the port has taken several measures such as installation of sprinklers, providing a green belt all around the port premises.

Figure 2-6 The land use in the Port of Visakhapatnam



2.7 Environmental issues

Ports are the centre of the nation's economic and urban life. Historically regional and national economies were based on the trade and commerce carried out in and around the country's coastal and riverine ports. Over time, changes in national and global economies, technological advances, and greater awareness of the environment have greatly altered the nature of port activities and their relationship to the host community and region. In the past, port development and operations often resulted in considerable alteration and damage to the natural environment. Today, largely in response to the national mandate for environmental protection, ports are more conscious and responsive to the need to minimize impacts on natural resources and the surrounding communities. In fact, the need to address environmental concerns is a top priority.

Visakhapatnam Port Trust is an ISO 14001 certified Port .It was the first port in South-East Asia to receive the ISO 14001 certification for the entire gamut of port operations. The port won the recognition through the implementation of a comprehensive environmental management programme. The port had declared its environmental policy in February 2001, which involved a multi-pronged strategy to control dust and water pollution, effective monitoring and efforts to conserve resources such as water, power and fuel.
VPT operation are rapidly increasing, Port has handled record cargo of 55 million tones during 2005-06 and ranked as no one among the major ports in the country and is poised for increase in Cargo traffic in near future. Port operations and development by their nature have the potential to impact one or more Environment media.

The activities in port do not generate pollution on its own. The pollution is generated due to handling of bulk cargo in ship, transportation of material from berth to storage yard, loading and unloading in storage yard, transportation through conveyor. In addition discharge of effluent by port base industries and city discharge, oil from ships contributing pollution to harbour waters. Over the years the land in port are being used for various minerals, accommodating port industries such as stevedores, warehouses, oil and chemical industry, tank terminals etc.

It has been observed that significant steps have been taken and being practiced by Port Authorities to control pollution in port. Environmental monitoring conducted in previous studies and Parameters monitored by environmental cell reflects that environmental parameters are found within norms in general. However some points have been noticed which are still attributing to Pollution. Although VPT has taken significant steps to control pollution, some areas are still attributing to pollution and may pose environmental problems. Port expansion and development activities will also effect environment directly and indirectly. Some areas of concern are as followed:

- Although VPT has taken significant steps to control Pollution but still air pollution in terms of dust has been observed at some of the places that has mainly generated due to handling of bulk cargoes, transportation of material from berth to storage yard, loading and unloading operations in the storage yard, transpiration through conveyor.
- At some place it has been observed that train and trucks were overloaded resulting dust emission during transportation
- Contaminated surface runoff from storage yards has been observed in absence of garland drains at some of the places.
- Low flow velocity conditions has been observed in SL Canal, Yerra gedda and Gangulagedda (Drains carrying city waste water). Due to this, sediments deposit within drain /canal hence manual cleaning of drains are practiced which is unhygienic
- All drains are substantially filled with not only by sediments deposition but also by all sorts of rubbish/plastics pieces, bricks and building material; giving an impression that the drains /canals are not only used for draining but also for dumping garbage.
- Solid waste is being dumped along the banks of canals and drains, which may be flushed downstream during monsoon resulting in clogging of the drains.
- Municipal Solid waste is being transported to Kaklupada dump yard but being dumped without segregation.
- It has been noticed that plantation is not sufficient at some of the places (near stack yards)
- It is observed that workers do not wear important safety gadgets such as earmuffs in noisy environments, dust filters while handling dusty cargo, etc.

- In the general cargo berth, it has been observed that the coal handling and storage causes dust emission. The open storage of coal and transportation is leading deposition of coal in all the surrounding areas even outside port area.
- Iron ore handling also causing dust emissions at the berth and transfer points.

2.8 Marine services

2.8.1 General

The presence of the natural groin on Dolphin's Hill, and the extensive tidal swamp on the west connected to the sea by the Salt Water creek known as Upputeru were the deciding factors for the creation of the Vizag Harbour. This port has tranquil deep water berths to handle cape size vessels Suez max and VLCC's.

Following are the essential services offered by the marine department of the port:

- Pilotage for berthing, shifting and sailing vessels – pilotage is compulsory for all vessels over 100 T entering, leaving or shifting berth. It is required to send the ETA 48 hours in advance. Port Control contacts all vessels on arrival giving information on pilot's arrival, berthing instructions, etc. Pilot boards in position 17°40.25'N 083°19.93'E. There are presently 7 pilots on muster against total strength of 9 and their scheduling is discussed in sections later.
- Towage: Port has in all 8 tugs, 3 of capacity 50 tons and 5 with the capacity of 30 tons, Tugs services is part of pilotage service as far as tariff is concerned.
- Mooring: Port has 4 mooring launches and 5 mooring gangs, these services also forms part of pilotage as far as tariff is concerned
- Salvaging (retrieval of cargo from dock basin)
- Dredging, hydrographic survey, fire & safety is also covered by marine department.

2.8.2 Pilotage

The scheduling of pilotage movements is quite critical to ensure efficient marine services in the port. Visakhapatnam port had 2108 vessel calls during 2005-06. There was almost an equal split of 1055 calls at inner harbour and 1053 calls at outer harbour.

The number of vessel movements in the port depends on the berthing period per vessel and the number of shiftings between berths. The size of ship as well as the quay/berth position has impact in pilotage time. The channel size in width and the marine restrictions also has impact on pilotage.

The time taken for berthing at the inner as well as the outer harbour is approximately 2 hrs and 15 minutes excluding the OSTT and the New Oil Mooring (NOM) where the time taken is almost 3 hrs and 15 minutes. Primarily the time difference is due to passing of extra mooring lines at OSTT and NOM compared to other berths.

Presently many shiftings takes place from the GCB to inner harbour. In some cases the vessels at GCB after lightering at anchorage due to tide restrictions and are subsequently brought into inner harbour. If the previous vessel is allowed to continue to discharge further for few hours till the tide

restriction is met this double shifting can be avoided, however the commercial obligations of traffic is to be viewed for this. Once the inner harbour is deepened such shifting could be reduced.
There is a proposal to widen the outer channel width from 200 to 250 m. This will facilitate night berthing of tankers having DWT greater than 150,000 tons. The widening of the outer channel is included in the project 'Up gradation of iron ore berth at outer harbour to cater to 200,000 DWT vessels. The inner harbour is proposed to be deepened to handle vessels with draft of 14 m. The new draft shall be sufficient for Panamax vessels at inner harbour.

2.8.3 Towage

Presently VPT has 8 tugs, 3 of 50 ton and 5 of 30 ton capacity. The approximate life period of these tugs is 20 years. Docking and un- docking can be a substantial safety hazard due to wind pressure, width of the harbour channel and the general layout of the berths and breakwater. Recently a study was carried out by Howe India and has recommended the tug capacity of 70 tons for handling cape size vessels as well as night berthing in above conditions.

2.8.4 Navigation aids and systems

The existing AIS (automatic information system) and the recent proposal to have radars in place at the marine control tower shall be sufficient for the navigation aid. The layout of the port is such that a technology such as VTMS is not required. However marine being the core competence of the port and looking at the future challenges the requirement of sophisticated applications to aid the decision in scheduling the resources of the marine in dynamic requirements of the commercial decision is vital.

2.9 Institutional and Organizational structure

2.9.1 Institutional setting

The ***Indian Ports Act (1908)*** lays down rules regarding safety of shipping and conservation of ports for the entire port sector and regulates matters pertaining to the administration of port duties, pilotage and other charges.

The ***Major Port Trust Act (1963)*** lays down the institutional framework for the major ports in India. Accordingly, each major port is governed by a Board of Trustees appointed by the Government of India.

The working conditions of port labour are governed by the ***Dock Workers (Regulation and Employment) Act of 1948***, which stipulates the terms and conditions of port labour employment, service rules standards and other welfare issues in the interest of port and dockworkers. The Act is highly protective of workers' rights and offers them complete job security

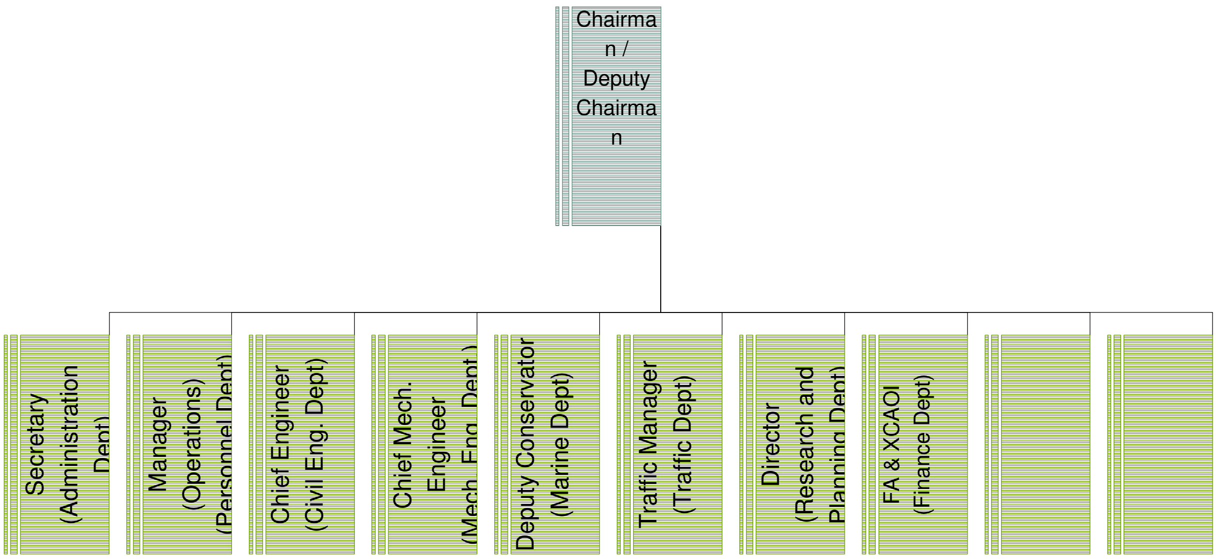
The 1996 guidelines provided for the establishment of the ***Tariff Authority for Major Ports (TAMP)*** to fix and revise port tariffs. The aim was to protect port users and equally to ensure that the port operators would get fair and reasonable reward on their investment. All powers for fixing tariffs in major port lies with TAMP, but it has no jurisdiction over minor ports or private ports.

The regulatory framework also includes shipping laws (Merchant Shipping Act of 1958) and environmental regulations (Environment Protection Act of 1986).

2.9.2 Organisation of VPT

Visakhapatnam port is under the Administrative control of the Ministry of Shipping, Road Transport Highways (MOSRTH) and is governed by Board of Trustees. Annexure 1 provides details of VPT Board of Trustees. The organisation structure at Visakhapatnam port is as presented below.

Figure 2-7 Organization structure VPT



In line with the recommendation of the Expenditure Reforms Commission, the port has been continuously attempting at rationalizing the total employee strength. The total employee strength which was 9,958 on 31.3.1996 has come down to 5762 (5216 excluding casual labour) by 1.4.2006.

In 2004, the port entrusted National Institute of Port Management (NIPM), Chennai with the task of identifying surplus staff in various departments of the port. The study identified 319 or 5.7% of the then existing strength of the port as surplus, thus proposing a total employee strength of 5,301. The findings are summarized in the table below:

Table 2-12 The staff of Visakhapatnam

Department	Present Strength	Proposed Strength	Surplus in Number	Surplus in Percentage
Administration	102	96	6	6
Personnel	83	69	14	17
Traffic	880	835	45	5
Finance	175	156	19	11
Materials	138	138	Nil	-
Civil	779	773	6	1
Elec. and Mechanical	2,192	2,038	154	7

Department	Present Strength	Proposed Strength	Surplus in Number	Surplus in Percentage
Deputy Conservator	770	694	76	10
Research and Planning	55	50	5	9
Medical	432	430	2	0
Overall	5,606	5279	327	6

Source: Study on identification of surplus staff at Visakhapatnam Port Trust

Employee grade, Pay scale, Incentives and Facilities

Employees are classified as Class I and Class II officers, Class III staff and Class IV workforce. The pay structure of all the classes has been revised from 1-1-1997. The revised scales would be in force for a period 10 years up to 31-12-2006. The incentives are paid to dredging, marine, railway, cargo handling, engineering and also clerical and supervisory staff. Medical facilities includes 124 bedded hospital equipped with a complete range of medical instruments. There are 3 primary and 3 high schools maintained and under the administration of port trust. As of 31/03/2005 1857 quarters are allotted to Port personnel. Personal protective equipment such as safety shoes, chest apron, hand gloves etc. is supplied to all the workers.

Annex 2.6 provides a statement showing the employment position with respect to existing strength – CLASS I, II, III & IV Including Casual Labour as on 1.4.2006.

2.10 Financial aspects

This section gives an overview of the current financial situation of VPT by presenting profit and loss accounts, balance sheets and financial indicators for the years 2003/04-2005/06. This overview will be used as starting point for further financial assessment (see further).

2.10.1 Profit and loss accounts

The profit and loss accounts of VPT for the years 2003/04-2005/06 are presented in the following table

Table 2-13 Profit and loss accounts for the years 2003/04-2005/06 (in Rs Cr.)

	2003-04	2004-05	2005-06
Revenues:			
Cargo Handling & Storage	233.9	260.9	273.6
Port & Dock Facilities	133.0	148.9	158.9
Railway Working	66.0	70.9	74.6
Rentable lands & Buildings	21.4	21.1	21.3
Total Revenues	**454.3**	**501.8**	**528.4**
Less:			
Employment	163.1	174.1	168.02
Stores	13.8	13.6	21.8
Repairs	18.9	19.2	18.3
Power, fuel, lubricants	27.7	32.3	35.1
Dredging	7.3	6.9	7.0
Other operational expenses	19.5	17. 8	21.38
General expenses	9.9	12.0	9.5
Total operating costs	260.2	275.9	281.1
EBITDA	**194.1**	**225.9**	**247.3**
Depreciation	26.9	28.4	31.2
EBIT	**167.2**	**197.6**	**216.1**
Plus: financial & miscellaneous income	11.1	14.6	14.4
Less:			
Interest	1.4	1.2	1.1
Extraordinary results	6.9	0.6	-1.0
Pension fund	60.0	180.0	0.3
Taxes	32.3	19.9	50.48
Net Income	**77.8**	**10.5**	**155.1**

Source: Administration reports VPT

Total revenues for the port as indicated, have risen to Rs 529 Cr., of which Cargo Handling and Storage accounts for 53%, or Rs 279 Cr. Total employment costs have been held fairly constant through lay-offs and retirements, despite increasing wages. It should be noted that the employment costs are indicated here as total costs, covering regular salaries, bonus payments, pension contributions and other staff related payments.

With respect to the results, the following observations can be made:

- Straight salary and wages make up around 50% of total employment costs. Together, employment related expenditure is 62% of total operating costs.

- Repair and maintenance expenditures are below 10% of total operating costs and amount to around 4% of the book value of the physical assets, which is well in line with other ports internationally.
- Expenditure for power, fuel and lubricants is rapidly rising, despite the constant efficiency measures targeted. Rising commodity prices for power generation are undoubtedly the major cause of the increase in this cost item.
- EBITDA has risen to over Rs 230 Cr. from just over Rs 150 Cr. in 2002-03. The increase is entirely due to the increase in revenues, combined with static total operating costs.
- Depreciation, at around 3% of historical purchase prices, amounts to around Rs 30 Cr.
- EBIT has risen to over Rs 200 Cr.
- Financial items are having a large impact on the bottom-line net income. This is due to backstopping of the Pension Fund. Once these payments are fulfilled, net income can be expected to rise rapidly.
- Currently, net income for 2005-06 is around Rs 155 Cr.

In general it can be stated that the financial position of VPT is healthy and the Port can add sufficient funds to its reserves. However, backstopping of the Pension Fund to the amount of around Rs 450 Cr. will have to be undertaken and this can have significant impact on the cash flow of the Port for several years.

2.10.2 Balance sheets

The balance sheets of VPT for the years 2003/04-2005/06 are presented in the table below.

Table 2-14 Balance Sheets for the years 2003/04-2005/06 (in Rs Cr.)

Item	**2003-04**	**2004-05**	**2005-06**
Assets			
Fixed Assets	739.4	743.5	738.7
Investments	203.9	198.5	448.5
Current Assets	205.6	231.7	342.0
Deferred expenditure	31.1	25.2	8.8
Total Assets	**1,180.0**	**1,198.9**	**1,538.0**
Equity			
Reserves & surpluses	996.1	1,021.0	1,198.9
Loans	20.1	18.0	15.9
Current liabilities	163.8	159.9	323.2
Equity & Liabilities	**1,180.0**	**1,198.9**	**1538.0**

Source: Administration reports VPT

The balance sheets show that the total assets have grown from Rs 1,180 Cr. in 2003/04 to Rs 1,538 Cr. in 2005/06. A substantial increase has taken place in investments/financial means, which are accounted for under the current assets. At the same time, fixed assets have been added almost equal to depreciation values and resulted in a static total fixed assets position of some Rs 740 Cr.

The loan position as of book-year 2005-06 was very low indeed, at just below Rs 16 Cr.. However, during the current year 2006-07 a new loan has been taken up by the port to finance the rehabilitation of the Iron Ore Handling complex. The amount involved is Rs 200 Cr., at favourable financial terms. The Yen-dominated loan carries an interest rate of 1.5% and pay-back period of 20 years, but the outstanding amount can be repaid at any time.

Overall, it can be concluded that the financial position of VPT is good and the Port has considerable funds for future expansion as well as substantial leverage possibilities.

2.10.3 Financial indicators and special issues

The table below presents some major financial indicators of VPT for the years 2003/04-2005/06.

Table 2-15 Financial indicators for the years 2003/04-2005/06

	2003/04	2004/05	2005/06
Net margin	17%	2%	30%
Operating ratio	43%	45%	46%
Current ratio	1.3	1.5	1.1
Debt to assets	0.0	0.0	0.0
Revenue per ton (Rs)	101	99	95
Cost per ton (Rs) (excl. financial items, incl. depreciation)	60	61	56
Net surplus per ton (Rs)	16	2	28

Source: Consultant’s calculations on basis of data provided

The net margin of the port has increased from 17% in 2003/04 to 30% in 2005/06, while the operating ratio has remained static at around 44%. The current ratio has fallen to 1.1 over the past three years as the current liabilities have increased.

Revenues per ton have fallen from 101 to 95 Rs./ton, but at the same time, the cost per ton has fallen as well, to reach 59 Rs. per ton. The net surplus per ton has increased to 29 Rs. per ton. It should be noted that these values have been impacted considerably by the (non-)payments to the Pension Fund.

At present, VPT shows sound credit rating. The financial strength of VPT makes co-financing feasible. The current debt to total assets ratio is nearly zero as per the balance sheet of 2005-06, and the debt to equity is likewise nearly zero. In capital intensive industries ratios of 2 are common. However, in order to be prudent, a ratio of 1 is reasonable initially.

The estimated cash flows for the years 2003/04 through 2005/06 are presented in the table following.

Table 2-16 Estimated Cash flows (in Rs Cr.)

	2004/05	2005/06
Net Surplus	10.5	155.1
plus interest after tax	1.6	3.5
plus NCC (non-cash item - Depreciation etc)	28.4	31.2
minus capex	32.8	26.5
Total cash flow	**7.7**	**163.3**

Source: Consultant's calculations on basis of data provided

The Port's cash flows are strong and provide ample room for debt servicing. The current debt is 16 Cr. Rs. If the current debt to equity ratio of 0.01 is taken into consideration, the debts can be increased substantially.

2.11 Port connectivity

2.11.1 Port hinterland connectivity

Like any other port the Port of Visakhapatnam also serves main outlet for:

- ***Immediate hinterland*** – the region in and around the port and city of Visakhapatnam formed due to the existence of industries related to oil refinery, steel/alumina manufacturing, pelletisation plant, fertiliser factory and so forth.
- ***Distant hinterland*** – other states such as Jharkhand, Bihar, Uttar Pradesh, Orissa, Madhya Pradesh, Andhra Pradesh, Eastern Maharashtra, Tamil Nadu and to some extent Karnataka.

The hinterland is rich in mineral resources such as iron ore, lime stone, coal, bauxite etc. which resulted in the establishment of number of mineral based industries like steel plants, fertiliser plant, alumina, cement plants in the hinterland of the port.

Indian Ports have traditionally focused on the terminal operations (seaside activities) than their interface with hinterland (landside activities). Rail and road transport is one of the important elements of entire import/export logistics chain. Adequate port connectivity to hinterland is very important as it helps smooth movement of cargo to and from hinterland (origin/destination). In case of Visakhapatnam port, the railway system assumes greater importance as out of total cargo handled at the port about 60-65 % cargo is rail borne cargo. Presently the road borne cargo traffic is about 10-15 % which is less as compared to the rail borne traffic but it is likely to increase in future due to increase in general cargo.

VPT handled about 56 Mt of cargo in the year 2005-06. This figure is likely to grow to about 85 Mt by 2012-13. This increase in cargo can be handled properly only if the port connectivity is adequate. Poor connectivity has an adverse effects on the competitiveness of ports vis-à-vis other ports in the neighbourhood. It is therefore imperative for the port to ensure seamless flow of traffic.

2.11.2 *Road infrastructure*

Road connection with the national highway grid

The road traffic originating or destined to Visakhapatnam can be classified into southbound and northbound traffic. The southbound traffic consists of traffic coming from Tamil Nadu, Kerala, Karnataka, East and West Godavari districts of Andhra Pradesh. The northbound traffic consists of traffic coming from Orissa, Madhya Pradesh, Bihar, Uttar Pradesh and Jharkhand.

The connectivity to Visakhapatnam port area from National Highway – 5 is through four roads.
Southbound traffic entering through Dockyard Junction via the

- New Gajuwaka road
- Industrial Bypass

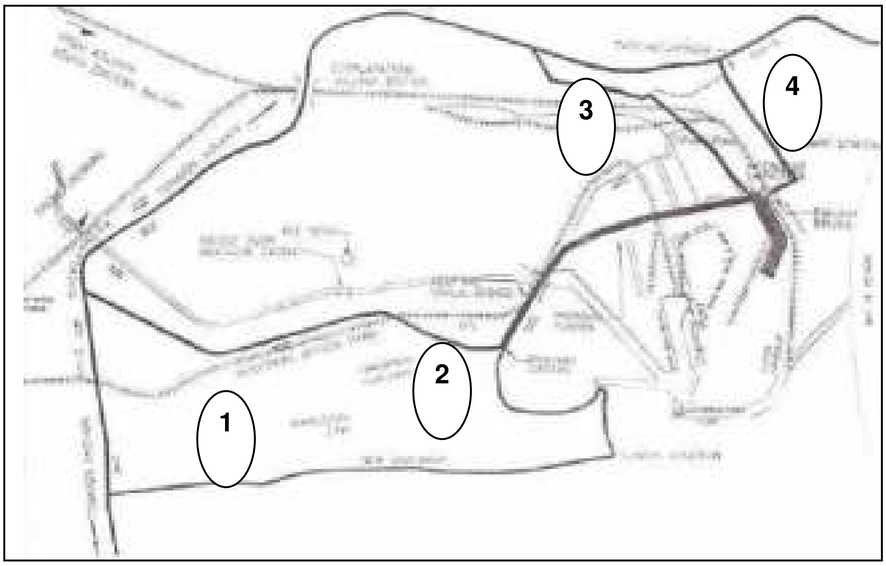
Northbound traffic entering through Convent Junction via:

- Gyanapuram Road
- Thadichetlapalem Road

These roads pass through the city where traffic restrictions are imposed prohibiting the heavy vehicle traffic during certain time periods of the day. Also the presence of underpass with very low overhead clearance, narrow road width and damaged pavement conditions which has resulted into congested roads and sluggish movement of traffic.

VPT has recently constructed a road connecting the port with National Highway – 5 which essentially links the port with its hinterland. The project stretch comprises of a total of 12.47 km connecting the Convent Junction (near port gate) to NH-5 (near Ayyappan temple) with about 4.87 km of flyovers and ramps.This Port connectivity road to NH5 is completed and opened for traffic w.e.f 15-12-2006.

Map 2-5 Access to NH-5 from port



Port internal roads
Total road network inside the port limit is about 67 km with width of the pavement varying from 3.5 to 9.0 m. Most of the road pavement is black top (BT) surface (see Annex 2.1). The crisscrossing railway lines meant for the industries/sheds in the port area has resulted into number of level crossings across the roads which obstructs the free movement of the traffic and also results into slow movement.

These roads pass through the city where traffic restrictions are imposed prohibiting the heavy vehicle traffic during certain time periods of the day. Also there are reasons such as presence of underpass with very low overhead clearance, narrow road width and damaged pavement conditions which has resulted into congested roads and sluggish movement of traffic.

The port connectivity road mainly facilitates the outward movement of road traffic i.e. from port to outside. However the inward movement of road traffic i.e. traffic entering the port and required to access the inner harbour (berth/storage) areas is still problematic. At present these areas are served by the internal roads, wherein the road traffic has to cross rail tracks (level crossings) at several places. This results directly in delays as the road traffic has to wait till the rail movements are over.

2.11.3 Rail Infrastructure

Rail connection with the national railway system
The Chennai – Waltair – Kolkata coastal railway line (now part of East Coast Railway) connects Visakhapatnam to the south and the north. This line branches off at Kothavalasa leading to Bailadila mines, also this main line goes further up North passing through coastal Orissa, West Bengal and up to Assam. The following map shows the national and state/regional railway grid.

Map 2-6 National and state/regional railway network

Western and northern states are also connected with Visakhapatnam by the rail link between Waltair and Raipur on Mumbai – Kolkata trunk route. The line is important for the imported coking coal and sulphur to the steel plants at Bhilai, Rourkela and Bokaro, Several products such as fertilizers and gypsum from M/s, CFL imported hard coke, LAM coke, clinker, petroleum products are moved from Visakhapatnam Port over these lines to various destinations of Orissa, Chattisgarh and Madhya Pradesh, Thermal coal from Mahanadhi Coal Fields in Orissa is brought to Visakhapatnam Port and shipped to Ennore, Tuticorin for the thermal power plants of TNEB. The steel products of Bhilai Steel Plant are brought from Bhilai to Visakhapatnam Port for export.

At Vijayanagaram, 30 km off Visakhapatnam the Chennai-Howrah mainline branches off and further branches at Rayagada catering to needs of western Orissa and Bengal. The line from Rayagada goes to the North to Nagpur catering to the needs of Chhattisgarh and Madhya Pradesh.

Port internal rail network

The port railway network consists of about 200 km of railway track and is the largest rail network in the major ports of the country. The system consists of various yards and sidings maintained by the port. Annex 2.2 provides the details of port railway system.

The railway network of the port is divided into two distinct sectors viz., iron ore traffic and traffic other than iron ore (such as food grains, fertilizers, thermal coal, steel products, coking coal, other mineral ores, POL products etc.). Traffic from Ore Exchange Yard is handled in eastern sector which at present is about 10-12 rakes per day. Traffic from R & D Yard is destined to eastern as well as western sector and mainly includes commodities like POL, fertilisers, FRM, coal, steel products, alumina, container and general cargo etc. Out of about 17 rakes handled at R & D Yard, about 6 rakes are destined to Western Sector per day and are mainly used for the commodities like POL, fertiliser, FRM and general cargo.

Visakhapatnam port serves fairly large hinterland in states Andhra Pradesh, Jharkhand, Bihar, Orissa, Madhya Pradesh, Eastern Maharashtra, Tamil Nadu and to some extent Karnataka. The hinterland is rich in mineral resources such as iron ore, lime stone, coal, bauxite etc. which has helped in number of mineral based industries like steel plants, fertiliser plant, alumina, cement plants have come up in the hinterland of the port.

2.12 SWOT

The SWOT assessments indicates that the port will continue to benefit from its the natural strengths, however its future position is being threatened by the proximity of the competing ports as well the bureaucratic procedures and tariff setting.

Based on the above discussed advances in the fields of global and Indian economic development and maritime transportation, in addition to characteristics of the Visakhapatnam Port itself, an analysis can be made of strengths and weaknesses of the port itself, and opportunities and threats it is faced with. The result of this SWOT-analysis is summarised below.

Strengths

- Deep water port in outer harbour and on anchorage
- Handling of VLCC at anchorage
- Deeper drafts berths in the Outer Harbour
- Mechanised handling of ore handling complex
- Good railway connectivity
- Healthy financial position (ex Pension liabilities)
- Policy aimed at reduction of manpower during last years
- Extensive scope for SEZ developments
- ISO certifications

Weaknesses

- Entrance channel capacity: 1-way passing system and common use for VPT and Navy
- A non-incentive tariff structure due to principle of non-discrimination
- Manual coal handling and operations with low productivities
- Over planned elements (availability and utilization of equipment versus depreciation norms)
- Limited number of shifts in the port
- Absence of modern ICT facilities
- Inefficient use of adequate of storage facilities
- Limited availably of shore unloading facilities for Cape size vessels
- Close proximity to city leading to evacuation problems

Opportunities

- Strong development of Indian economy leading to trade and traffic growth
- Focus of GoI-policy on removing infrastructure bottlenecks
- Further enhancement of industries and associated trade by GoI-policy
- Strong demand for crude oil and petroleum products – globally as well as in India
- Plans for substantial investments by industries in hinterland of Visakhapatnam indicating growth potential

Threats

- Strong inter-port competition on hinterland of Visakhapatnam
- Substantial investments by other, competing ports, especially in the nearby Gangavaram
- Relatively strong labour unions
- Compared with private ports, a relatively long procedure for decision making

2.13 Strategy for VPT

2.13.1 Vision of VPT

The characteristics of the port of VPT and the main conclusions from the SWOT analysis have been used to develop a focus for the port's future development. Particularly the relatively good hinterland connections (railway connectivity), the presence of deep-draft berths in the Outer Harbour combined with a rather healthy financial position offer an excellent starting position. However the future financial obligations regarding the pension fund and to face potential threats such as investments in private (competitive) ports along the Indian East Coast will be a big challenge for VPT to manage the port on a financially sound and economic and environmentally beneficial way by offering highly efficient and competitive services.

The outcome of the visioning workshop regarding Vision and Brand is given below:

Vision and mission

Based on the results of a workshop, the consultant and VPT came to the following vision:

"VPT to be the most preferred port in South Asia offering services of global standards"

The Brand is:

"The East Coast Gateway"

The Mission Statement is:

"To be a major partner in meeting the logistics requirements of the importers and exporters of the region"

2.13.2 Commercial strategy

At this moment Visakhapatnam Port Trust has no separate commercial department to be responsible for business development and marketing. The most important activity of the commercial strategy is to establish a business development and marketing department. As soon as the Commercial Department has been established it has to consider and prepare the following items and activities:

- the set up of a commercial information system based on separate accounts;
- the formulation of a tariff and discount policy fitting the strategic aims of VPT and the national policy rules for major ports;
- the formulation of an acquisition policy focusing on industry, logistic companies and free zone interests;
- the preparation of an active promotion policy (advertisements, participation in commercial fairs, etc);
- the preparation and erection of a port promotion council together with existing port users

The commercial information system is one of the most important tools of the Commercial Department. In this system all the interactions with (potential) clients are stored in order to have an effective and efficient follow up and tracking system. VPT will play a landlord role meaning that the commercial focus will shift to trade and transport facilitation instead of making money out of port operations. Together with the existing port users the commercial department should erect a Port Promotion Council. In most ports around the world a large percentage of new clients are attracted by the presence of existing port clients for reasons of clustering, co-sitting and synergy reasons. The Port Promotion Council will serve as the permanent business to business promotion of the port.

2.13.3 Financial strategy

The current static financial situation of VPT available for project finance is characterised as healthy (see chapter 10). In case the investments are foreseen for the extension of the port capacity and VPT would act as a service port the following financial options can be used for project financing.

Table 2-17 Financial options

Option	Judgement
Own equity	Insufficient
Subsidies	Probably not available
Soft loans	With international donors is go to go decision. This involves long periods.
Commercial loans	Depends on the availability of collateral, requires financially feasible projects for relatively short finance period, while projects are long term
Private Sector Participation	Attract private capital

Source: Consultants analysis

Given the available means, consultants consider the financial options available as indicated in the table above, with the main conclusion that the available resources are insufficient and that private capital will be needed for a very substantial part of the projects.

2.13.4 Port development strategy

The port development strategy aims at increasing the port's capacity to facilitate higher volumes of cargo by introducing improved infrastructure and modern handling techniques.

The Outer Harbour of Visakhapatnam has an advantage over most other major ports in India that is has deep water and can accommodate these larger vessels. Expansion of the port should therefore be focussed at the Outer Harbour in the sense of developing new deep-water berths and improving of cargo handling rates. Dry bulk and crude should be handled in the Outer Harbour or even outside the breakwaters by SBM, while general cargo will be handled in the Inner Harbour.

The Inner Harbour is suitable for all general cargo or cargo that does not require vessels with large draft, for example, the export of thermal coal. Some deepening of the channel and the berths might be required. The efficiency of the handling of bulk cargo in the inner port should be increased by mechanization of the berths to create more space at other berths to allow for increased cargo throughput. Several berths in the Inner Harbour allow for the development of dedicated berths for private operators on a BOT-basis or on a lease base.

2.14 Private Sector Participation in VPT

2.14.1 Policy of the Government of India

The Government of India, which administers the major ports, has realised that port restructuring is essential if Indian exporters are to be given an opportunity to enjoy the efficiencies and low costs in transportation as are available to their competitors elsewhere. Policy guidelines were issued, which provided for private sector participation/investment in the following areas:

- Leasing out existing assets of the port.
- Construction/creation of additional assets, such as:
    - Construction and operation of container terminals.
    - Construction and operation of bulk, break bulk, multipurpose and specialised cargo berths.
    - Warehousing, container Freight Stations, storage facilities and tank farms.
    - Cranes/Handling Equipment.
    - Setting up of captive power plants.
    - Dry-docking and ship repair facilities.
- Leasing of equipment for port handling and leasing of floating crafts from the private sector
- Pilotage
- Captive facilities for port based industries

Private Sector Participation (PSP) is best implemented through standardized arrangements that constitute a stable policy and regulatory regime where private capital derives greater comfort and seeks the least possible risk premium. The key to making PSP acceptable is to create an environment where PSP is seen to be a way of attracting private money into public projects, not putting public resources into private projects.

2.14.2 Definition and motivation: success conditions

This section provides in general terms the institutional possibilities for Visakhapatnam Port Trust to transform the present port administration into a modern and uniform landlord port model. At this moment different types of PSP exist in the port and the main question is how to formulate and implement the way ahead.

The strategic logic behind the PSP rationale can be summarized as follows:

- there is societal and commercial need for the revitalization of the port in many ways: terminals, hinterland connections, administration, labour, etc
- the realization of all these elements require substantial investments,
- which can not be paid for by an extension of the national account

Private sector participation in seaports is considered to be:

- a formal relationship between a port authority and a commercial company;
- focused on synergy by means of the realization of converging goals;
- with both societal and commercials aspects,
- under condition of the existence of the respective identity and responsibilities of both partners.

In other words, PSP is about a certain co-arrangement between a port authority and commercial companies, based on the expectation of synergetic effects. A concession can be seen as one example of a co-arrangement.

At present, Visakhapatnam Port is organised based on a mix of the above-mentioned port administration models. Visakhapatnam Port is organised according to the landlord model (in case of private jetties), owns and rents out equipment (tool port organisation) and indirectly has influence on cargo handling operations (service port model).

The motivation for PSP is because of one of the following reasons:

- financial means: the possibility to provide the necessary means completely by public funding are not present;
- certainty: the port authority would like to acquire certainty and agreements with the market, especially in the planning phase;
- realization/exploitation: by the mobilization of private capital the realization of a project can be more rapidly;
- cost savings: under circumstances it can be more attractive for a port authority (faster, cheaper) when the private company which is taking care of the realization of the investment plan is also responsible for the preceding realization of infrastructure and the technical detailing;
- expertise: a port authority can be lacking specific knowledge and there fore requires private companies to submit ideas and proposals.

3. THE POTENTIAL MARKET FOR VPT

3.1 Market orientation

3.1.1 World developments

Generally, economic growth in most parts of the developing world and the economies in transition are well above the world average. On average, developing economies are expected to expand at a rate of 5.6% and the economies in transition at 5.9%, despite the fact that these economies may face larger challenges during 2006. Although China and India are by far the most dynamic economies, the rest of East and South Asia is expected to grow by more than 6%. Latin America and the Caribbean is lagging somewhat behind, with growth of about 3.9%, but African economic growth is expected to remain solidly above 5%.

The development of world trade has, with the exception of 2001, been characterized by strong growth figures, resulting from the continuing globalization of the production of consumers products. In 2002, 2003 and 2004 a growth rate of global trade of 3.5%, 5.5% and 10.9% have been recorded respectively. Although the growth rate of world trade declined to from 10.9% in 2004 to 7.0% in 2005, the growth in world trade (trade in goods measured in constant prices) is expected to remain solid and stabilize at a growth rate between 6.9% and 7.6% in the period 2006-2010. The following table illustrates the projections on global trade of goods as presented by the Economist.

Table 3-1 World Trade of goods % growth

Indicator	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
World Trade	-0.4	3.5	5.5	10.9	7.0	7.0	6.9	7.4	7.6	7.6
Developed countries	-1.1	1.6	2.9	8.2	5.5	5.3	5.3	5.8	6.0	6.1
Developing countries	1.4	8.6	12.0	17.1	10.3	10.5	10.0	10.4	10.5	10.1

Source: The Economist

The world trade growth forecast indicates an annual growth rate of around 7.5% per year in the period 2008-10, sufficient to imply rising imports in most markets. Asia is expected to see the fastest rates of export growth over the forecast period, closely followed by east-central Europe. Chinese exports will rise particularly quickly, however performance will not match the spectacular growth seen over the past few years, when foreign sales regularly rose by over 20% per year. The West European trade growth will remain sluggish in comparison with that of other regions. The following table provides an overview and projection of the region wise GDP development for the period 2006 to 2010.

Table 3-2 Real Global GDP growth in %

	2006	2007	2008	2009	2010
US	2.9	2.9	3	3.1	3.1
Japan	1.3	1.1	1.2	1.1	1.2
Euro 12	1.6	2.0	2.0	2.0	2.0
EU25	1.9	2.2	2.3	2.2	2.1
OECD	2.3	2.4	2.5	2.5	2.5
Non-OECD	6.3	5.9	5.7	5.8	5.7

Source: The Economist

On a time frame until 2050 Goldman Sachs foresees a continuing growth of the world economy based upon the continuation of the current trend of production shift. Over the next 45 years, Brazil, Russia, India and China – the BRIC economies – could become a much larger force in the world economy. If things go right, in less than 40 years, the BRIC economies together could be larger than the G6 in US dollar terms.

3.1.2 National economic developments

The table below illustrates the growth of the national economy of the GDP at Indian market prices and US prices. Both in Indian Rupees terms and in USD terms the GDP has grown strongly, representing an average annual GDP growth of more than 5.5% since 2001. Since 2002 GDP has grown with a rate of 7.5% and higher. Since 2001 the inflation of consumer prices has remained stable between 3.8% and 4.8% annually, while export and imports in terms of value have more than tripled.

Table 3-3 Recent developments of Indian key economic indicators

	2001	2002	2003	2003	2005	2006*
GDP (Billion Rs)*	21,445	22,223	24,063	26,115	28,343a	30,477
GDP (US$ bn)**	478.3	506.1a	595.0a	691.6a	797.8a	864.1
Real GDP growth (%)	5.3	3.6	8.3	8.5	8.5a	7.5
GDP per head (US$)	460	480	560	640	730	780
Consumer price inflation (av; %)	3.8	4.3	3.8	3.8a	4.2a	4.8
Population (million)	1,034	1,050	1,065	1,080	1,095	1,110
Exports of goods fob (US$ m)	44.8	51.2	60.9	77.9	98.1a	111.2
Imports of goods fob (US$ m)	56.8	60.7	75.5	105.9	149.8a	185.6
Exchange rate (av) IRP :US$	47.2	48.6	46.6	45.3	44.1	45

*at constant market prices
** at market exchange rate
Source: The Economist

Population has grown from 1 billion to 1.1 billion in 6 years, representing an average growth rate of 7% annually. India's economy is expected to continue booming this year: The latest data published by the Central Statistical Organization for the first quarter of 2006 indicates that real GDP growth for fiscal year 2005/06 will be 8.5% (at current market prices), and that the Indian Economy on a global scale is the second fastest growing economy.

Projected indicators 2006 - 2010

It is estimated that after this year growth rates will slow to a solid 7.5% in 2006/07 and 7.3% in 2007/08 resulting from continuing growing economic importance of the manufacturing and services sector. The following table provides a projection of the future development of the key characteristics for the Indian Economy.

Table 3-4 Projections of the development of Indian key economic indicators

	2006	2007	2008	2009	2010
GDP (Billion Rs)*	30,477	32,711	34,927	37,217	39,744
GDP (US$ bn)**	864.1	934.4	1,052.30	1,178.40	1,294.30
Real GDP growth (%)	7.5	7.3	6.8	6.6	6.8
GDP per head (US$)	780	830	920	1,020	1,110
Consumer price inflation (av; %)	4.8	4.1	4.4	4.4	4.3
Population (million)	1,110	1,125	1,140	1,155	1,170
Exports of goods fob (US$ m)	111.2	130.3	145.4	163.1	185.1
Imports of goods fob (US$ m)	185.6	-215.1	-235.6	-262.3	-295.3
Exchange rate (av) IRP :US$	45	46.2	46.5	46.9	48

*at constant market prices
** at market exchange rate
Source: The Economist

The Planning Commission of India recently released a draft document 'Towards Faster and More Inclusive Growth: An Approach to the 11th Five Year Plan' that offers an idea of the commission's perspective for the plan period 2007-12. To reduce poverty to less than 10% and double the income of average Indian in less than 10 years calls for a target GDP Growth rate of 8.5% in the plan period combined with broad based policies.

To grow at 8.5% in the plan period, a second green revolution is needed in agriculture to raise the agriculture GDP growth rate to nearly 4% from the current period's estimated level of less than 2%. Manufacturing will have to grow at 12% from its current period's estimate of less than 8%. The most important constraint in achieving a faster growth in manufacturing is the fact that infrastructure consisting of road, railways, ports, airports, communication and power does not measure up to the standards prevailing in competitor countries.

The period will require an increase in domestic investment from around 29% to nearly 34%. Preliminary estimates suggest that investment in infrastructure will need to increase from the current 4.6% of GDP to nearly 8% in the 11th plan. Since the public sector resources are scarce, an aggressive effort at promoting public private partnership in infrastructure development will be needed. The 11th plan will therefore place special emphasis on infrastructure and improvement in the investment climate to attract private investment.

The most important constraint in achieving a faster growth of manufacturing is the fact that infrastructure, consisting of roads, railways, ports, airports, communication and electric power, is not up to the standards prevalent in competitor countries. This must be substantially rectified within the next 5-10 years if enterprises located in India are to compete effectively. In the increasingly open trading environment that we face today, producers must compete aggressively not only to win export market share but even to retain domestic market share against competition from imports. Indian industry recognises this and no longer expects to survive because of protection. But they do expect a level playing field in terms of quality of infrastructure. This should have high priority in the 11th Plan.

Shortage of electric power and the unreliability of power supply are universally recognised as a drag on the pace of India's development. The competitors of India benefit from round the clock supply of power at stable voltage and frequency, but this remains elusive in most parts of India.

The sector growth rates consistent with the growth scenarios presented above are given in Table 3.3. As per the 11^{th} 5-year plan of the Government of India, the agriculture growth targets are explicitly derived from the demand side assuming virtually zero growth in agricultural imports and a step up in the rate of growth of agricultural exports by 10% per annum. Services sector growth is projected in relation to GDP growth with an elasticity of 1.1, which is slightly lower than in the past. The industrial growth targets are determined residually.

In deriving the trade figures, net exports are projected at the level necessary to calibrate aggregate demand and aggregate supply. Import growth has been related to overall GDP growth with an elasticity of around 1.5, which is somewhat higher than the historical average of 1.3, reflecting the assumed impact of trade liberalisation and greater dependence on energy imports. However, in these calculations it has been assumed that there is no further change in energy prices. The growth rate of gross exports (see the table below) reflects the level of gross exports implicit in the estimates of net exports and gross imports as derived above.

Table 3-5 Structure of Growth in Different Scenarios (in %)

Scenario's	Low	Medium	High
GDP set as target	7.0	8.0	9.0
Agriculture	3.2	3.7	4.1
Industry	8.2	9.4	10.5
Services	7.7	8.8	9.9
Imports*	10.9	11.7	12.5
Exports*	14.2	15.4	16.4

Note: *Measured in US dollars. In the case of imports, it is assumed that the price of oil remains constant at $70 per barrel from 2006-07 onwards and average tariff rate stabilises at 10% from 2008-09.

These scenarios suggest that demand for agriculture will restrict its growth to between 3% and 4%. Services could grow at 8 to 10% and industry a little faster, exceeding 10 percent growth in the 9% GDP growth scenario. The implicit growth of manufacturing sector, which is a subset of industry, would be around 12% in the 9% GDP growth scenario. The target growth rates for Industry and Services certainly appear feasible in the light of recent performance, although the agricultural growth rate is much higher than recent trends. Nevertheless, every effort will need to be made to achieve the agricultural growth targets, since failure on this count may require excessively high targets for the non-agricultural sectors in order to attain the over-all GDP growth rate and also expose the economy to needless vulnerability.

Projected indicators 2010 - 2020

After 2010 India, China and the US will grow to a joint contribute of USD 1 trillion to the global economy in 2020, according to a study "Foresight 2020" conducted by the Economist Intelligence Unit (EIU). The next fifteen years will see significant outpacing by Asia and particularly the powerhouses of

India and China of the rest of the world in gross domestic product (GDP), wages and consuming power. India is estimated to contribute 12.2% to global economic growth by 2020.

The economist projects the continued rapid growth of India as one of the fastest growing economies. By 2020 India as a trading nation will record the biggest jump in world ranking-from 24th to 10th. Propelled by fast growth in India and China, Asia will increase its slice of the world's GDP from 35% in 2005 to 43% by 2020. India's share in the global GDP is estimated to rise from 6.2% in 2005 to 8.8% in 2020.

World's consumer spending will expand at an average annual rate of 5.6% to US$ 62 trillion by 2020 compared to US$ 27 trillion today. Though US will continue to be the largest consumer market, China will emerge as the world's second largest consumer market and India will rival the bigger European markets. India's share in world consumer spending will increase from 1.9% in 2005 to 3.1% in 2020.

India's growing integration with the global economy and its favourable demographics are likely to ensure an average sustained rate of growth of GDP of 5.9% a year in the period 2010-20. India's drivers for growth will mainly depend on the modernization of the country's agriculture and manufacturing sectors.

3.1.3 National policy developments and natural resources

Agriculture

The 11th Plan aims to reverse the deceleration in agricultural growth from 3.2% observed between 1980 and 1996-97 to a trend average of only 1.5% subsequently. To reverse this trend, corrective policies adopted must focus not only on the small and marginal farmers, who continue to deserve special attention, but also on middle and large farmers who too suffer from productivity stagnation arising from a variety of constraints.

The growth rate of agricultural GDP needs to be lifted to around 4%. This task has to be seen in the light of actual growth of agricultural GDP, including forestry and fishing, which was only 1% per annum in the first three years of 10th Plan and even the rosiest projections for 2005-06 and 2006-07, would limit this below 2% for the full five year period.

Manufacturing

The manufacturing sector has also not grown as rapidly as might have been expected. The average growth rate of this sector has accelerated compared to the Ninth Plan but is unlikely to exceed 8% in the 10th Plan. For the 11th plan, the growth rate is targeted at around 12% in order to achieve a GDP growth of between 8 and 9%

India's remarkable success in IT enabled services has prompted some observers to conclude that China has a comparative advantage in manufacturing whereas India has an advantage in services and we should therefore concentrate on growth of high value services. This approach is simplistic. India's performance in IT enabled services and other high-end services is clearly a source of strength that we must build upon. However, India cannot afford to neglect manufacturing. India meets most of the requirements for attaining double-digit growth in manufacturing. We have a dynamic entrepreneurial class that has gained confidence in its ability to compete. We have skilled labour and excellent management capability. However there are other constraints that limit our competitiveness, especially in labour intensive manufacturing, and the 11th Plan must address these on a priority basis.

Heavy industry policy

For the longer term through 2020, India has set itself on a rapid expansion path to be arrived at, from the heavy industry, predominantly mining and basic and intermediate goods production. The steel industry alone is to nearly triple capacity in 15 years. As a user of some of the main raw materials that India possesses, this focus on iron and steel will have a large impact on linked industries, both forward as well as and backward, such as ports and mines.

Table 3-6 Production, Imports, Exports and Consumption of Steel (in Mt)

	Production	Imports	Exports	Consumption
2019-20	110	6	26	90
2004-05	38	2	4	36
CAGR*	7.3%	7.1%	13.3 %	6.9 %

Source: National Steel Policy Document, November 2005*

The government insists that rapid growth has to be achieved, in order to raise the incomes of the mass of the population sufficiently to bring about a general improvement in living conditions. The Planning Commission expects that the economy can grow between 8% and 9% per year on a sustained basis provided appropriate policies are put in place. With population growing at 1.5% per year, this would ensure that the real income of the average Indian would double in ten years.

The private sector, including farming, small-scale enterprises and the corporate sector, has a critical role to play in achieving the goals. This sector accounts for 70% of the total investment in the economy and the government aims at creating an environment in which entrepreneurship can flourish.

The Iron and Steel complex

The country has rich endowments of iron ore and non-coking coal, and has cheap labour. Yet this advantage is neutralized considerably by low material and energy efficiency, poor quality, poor productivity, and high cost of coking coal, power, freight and finance.

The production of the planned 110 Mt of Iron and Steel by 2019/20 puts considerable demands on the iron ore and coal industry as well. Iron Ore needs rise nearly fourfold, while coking coal needs increase three fold.

Table 3-7 Critical Inputs for Steel Production (in Mt)

	Iron Ore	Coking Coal	Non-Coking Coal
2019-20	190	70	26
2004-05	54	27	13

Source: National Steel policy 2005 of Ministry of Steel, Govt. of India

Iron Ore

At present, the in-situ reserves of relatively rich iron ore in India are 11.43 billion tonnes of haematite and 10.68 billion tonnes of magnetite ores. Though the reserves of haematite ore appear to be large, high-grade lumpy reserves constitute only 8.7% of the total. Furthermore, as per the estimates of the Federation of Indian Mining Industries (FIMI), the present commercial mining capacity for iron ore is only 175 Mt. Production of iron ore in 2004-05 was 145 Mt, of which 54 Mt was domestically consumed and 78 Mt was exported. In order to ensure availability of 190 Mt of iron ore for domestic production of steel by 2019-20, Government is encouraging investments in creation of an additional modern mining and beneficiation capacity of 200 Mt.

After remaining stagnant at around 35 Mt for about a decade (between 1991-92 to 1999-2000), exports of iron ore from India have grown in the last 4 years to 78 Mt in 2004-05 on the back of large exports of iron ore fines to China. Fines and concentrates, which have little use in India except as a negative environmental externality, make up about 90 percent of Indian iron ore exports currently. As investments are made into beneficiation, sintering and pelletisation in the country, which will use these fines, the growth in exports of iron ore is likely to decline. Exports have thus been estimated to be around 100 Mt by 2019-20. In terms of future policy, exports of iron ore, especially high-grade lumps, would be leveraged for imports of coking coal or for investment in India. With the fast growing needs of the local industry, exports will be kept in check and a judicious balance would continue to be maintained between exports and domestic supply of iron ore.

Coal

Coal production is nationalised at present and private investment in coal mining is only allowed for captive mines supplying coal to designated sectors, power, steel and cement. Taking a longer-term view of energy production there is a strong case for denationalising coal so that private sector investment can come into this crucial area. If petroleum, which is much scarcer than coal, is open to the private sector there is no reason why coal should not also be opened up, especially if we take a longer term view of energy constraints and also the need to absorb new clean coal technologies. Pending a consensus on this issue, every effort should be made to expand coal production through the route of captive mines. Large coal users, especially in the power sector, can be given available proven coal blocks for developing captive mines.

Coking Coal

The proven reserves of prime coking coal are only 4.6 billion tonnes. The quality of Indian coking coal which is high in ash content is also not suitable for steel making which requires low ash content coking coal. The production of coal during 2001-02 was 328 Mt, out of which coking coal amounted to only 29 Mt. The low ash coking coals required by steel makers was around 10 Mt only in 2001-02. Further coking coal production has declined at an annual rate of 4.7% during the decade ending 2001-02.

As a result poor quality domestic prime coking coal has to be blended with imported coal. Currently the steel industry imports around 19 Mt of coking coal annually, and procures 7.5 Mt from indigenous sources including captive mines. By 2019-20, about 70 Mt of coking coal will be required, of which 85% or 60 Mt will have to be imported, or 60 Mt.

The imperatives of coking coal security require that new sources of coking coal be tapped. Accordingly, the Government would aim for the coal sector to become market-driven, but in the meantime continue allocation of captive coking coal blocks to steel plants, and establish mechanisms to share their surplus resource with other steel plants. The Government would encourage joint ventures and equity participation abroad by steel and coal companies. Simultaneously, efforts would be made to develop and adapt technologies, which have synergy with the natural resource base (non-coking coal) of the country. The steel industry would be encouraged to make investments in washing and beneficiation of coal.

In the medium term, captured in the 11th Plan, Coal will remain the dominant primary source of commercial energy and total demand for coal is projected to increase from 432 Mt in 2005-06 to 670 Mt in 2011-12. The need for the power sector itself would increase by 180 Mt taking the total to about 500 Mt in 2011-12. Meeting these demands poses a formidable challenge in increasing coal production. Coal India is currently aiming to increase production by an unprecedented 60% during the 11th Plan period inclusive of the recently approved emergency production plan. However, realistically speaking, this level of increase in output, together with the necessary rail infrastructure to move the additional coal production, may be difficult to achieve by Coal India alone.

Non-coking coal

With proven reserves of 74 billion tonnes, non-coking coal constitutes around 82 percent of the total coal reserves in India. Production of non-coking coal at 294 Mt during 2001-02 was 91 percent of the total coal production of 328 Mt. Available data show a declining rate of growth in production of non-coking coal in India. In the decade of 1980s, the growth rate was 6.5 %, which fell to 3.9 % in the 1990s. In the last five years the growth rate has been 4.7%. The power plants especially those that are located on the coast far from pitheads are, therefore, planning to import large quantities of thermal coal.

While market forces should allocate resources to their most efficient uses, which would require the coal sector to be deregulated, a strategy for the transitional period would be needed. Accordingly, the sponge iron and steel industry would get first priority in the allocation of higher grades of non-coking coal of below 12 % ash content, being essential feedstock. Simultaneously, efforts would be made to develop and adapt technologies, which have synergy with the natural resource base (non-coking coal) of the country

In 2004-05, the steel sector consumed about 8 Mt of non-coking coal, excluding thermal coal for captive power plants.

For the medium term it is estimated in the 11th Plan that the country may need to import 40-50 Mt of superior grade thermal coal by the end of the plan period. Thermal power stations on the Southern and Western coasts can be competitive using imported coal and the country's electricity requirement justifies such import. This requires necessary port handling capacity and coast based power generation capacity of around 12,000 to 15,000 MW to absorb the thermal coal imports.

However, power plants, both existing and proposed, in eastern part of India in the service area of Visakhapatnam Port are located at pitheads and therefore not likely to import thermal coal.

Some of the power projects in Chhattisgarh and Jharkhand listed below are illustrative of the above.

- Jindal Power Ltd. (JPL) a wholly owned subsidiary of Jindal Steel & Power Ltd, is setting up a 1000 MW (pithead) O P Jindal Super Thermal Power Plant at Raigarh, Chhattisgarh, with an investment of over Rs. 4,500 Cr. The financial closure has been achieved and the plant is expected to become operational by 2007. Coal for the plant will be drawn from the adjacent captive mines at Dongamahua

- Nagpur-based Jayaswals Neco has proposed to set up a commercial power plant at Moitra village in Hazaribagh district of Jharkhand. The company is in the process of finalising the acquisition of 500 acres of land for the project. Land is expected to be in possession by February 2007.The 270-mw coal-fired plant will have two units of 135 mw each. The company has targeted to commission the Rs 1,200 crore projects within 30 months from zero date. The company has coal mines with estimated reserves of 30 Mt in Moitra village itself, company officials further stated.
- As per Tata Power's 87th annual report, the company is in talks with Tata Steel and will enter into a power purchase agreement with the latter for the sale of power from these units once Tata Steel firms up its plans. Tata Power proposes to set up a 744 MW project in Chhattisgarh and two projects of 1,000 MW each in Jharkhand and Orissa. Tata Power has applied for allocation of 12 captive coal blocks in Jharkhand, Orissa and Andhra Pradesh.
- Tata Steel plans to set up a six- million tonne plant with an investment of Rs 15,400 crore in Orissa, a five million tonne plant in Chhattisgarh by investing Rs 12,000 crore and a 12 million tonne plant in Jharkhand by investing Rs 40,000 crore.

Sponge iron grade non-coking coal

The sponge iron industry using non-coking coal as input material will play an important role in future as a substitute input for coke. The capacity of sponge iron industry is set to increase from the current 13 Mt to 20 Mt by the end of 2010-11, at a growth rate of 6.5 percent per annum, and thereafter, till 2020, grow to 38 Mt. The current trends indicate that a large number of sponge iron based steel units may come up in the states of Orissa and Jharkhand. By 2019-20 the steel industry will demand around 26 Mt of non-coking coal of higher grades.

Oil and Gas

India's per capita energy consumption is 0.34 million tonnes oil equivalent (mtoe). The global figure is 1.7 mtoe, 5 times India's consumption. The estimated crude oil reserves in India are about 786 Mt as of March 2005, a mere 0.48% of global reserve and there were 123 oil fields and 31 oil & gas fields. The total production of crude oil during 2005-06 was 32.19 Mt and an estimated 98.5 Mt was imported to meet the demand. India's total refining capacity of 132.46 Mt per annum comes from various refineries spread across the country as shown in Figure 3.1. New capacities / expansions planned / under implementation to the tune of 95.5 Mt will result in the available capacity rising to around 228 Mt in the next 10 years. Industry estimates indicate that annual domestic production will remain in the region of 35 Mt and imports will rise to about 185 - 190 Mt India will therefore remain dependent on crude oil imports. Fortunately, the demand for petroleum products has grown at only 2.7% per annum in the first four years of the Tenth Plan. Consumption of petroleum products is likely to rise from 112 Mt in 2005-06 to about 135 Mt by the end of the 11th Plan with net crude oil imports reaching 110 Mt.

For Visakhapatnam Port, the proposed expansion of HPCL Refinery at Visakhapatnam from the existing 7.5 Mt to 8.33 Mt during the current year and subsequently to 15 Mt by 2009-10 is of significance in terms of crude imports as well as product exports. This is discussed in greater detail in Chapter 4.

India will remain dependent on crude oil imports. Fortunately, the demand for petroleum products has grown at only 2.7% per annum in the first four years of the Tenth Plan. Consumption of petroleum products is likely to rise from 112 Mt in 2005-06 to about 135 Mt by the end of the 11^{th} Plan with net crude oil imports reaching 110 Mt. Gas consumption is forecast to rise to about 55 MTOE with imports reaching 20 MTOE unless the recent finds announced in the KG basin actually start flowing in significant quantities by the terminal year of the 11th Plan. This assumes that Naphtha based fertiliser production switches completely to gas by the end of the 11^{th} Plan. The scope for trans-national gas pipelines needs to be explored from a longer-term perspective, but no pipelines are likely to become available for this level of gas import during the 11^{th} Plan. Thus LNG imports would need to rise to four times from the current level of 5 Mt.

The most important policy issue in this sector relates to pricing petroleum products. The recent increase in oil prices is now expected to persist for some years and although prices of some petroleum products have been raised the increase still leaves a large uncovered gap. This gap is being borne partly by the oil companies and partly by the issue of bonds by the government to the companies, which is equivalent to a government subsidy. Other critical issues facing the oil and gas sector relate to: (i) pricing of domestically produced natural gas and its allocation to the power and fertiliser industry; (ii) strengthening upstream regulation in the oil and gas sector; and (iii) ensuring competition and open access in the proposed pipeline transportation and distribution grid.

In the longer run, the only viable policy to deal with high international oil prices is to rationalise the tax burden on oil products over time, remove fat which may exist in existing pricing mechanisms which give the oil companies an excessive margin, realize efficiency gains through competition at the refinery gate and retail prices of petroleum products, and pass on the rest of the international oil price increase to consumers, while compensating targeted groups below the poverty line as much as possible.

The current method of determining prices for petroleum products on the basis of import parity needs reconsideration. India is deficient in crude oil but has developed surplus capacity in products. Product price entitlement should therefore be based on export parity pricing, which would be much lower than import parity. The 10% duty on products has been reduced to 7.5%, which is a step in the right direction. There is a strong case for further reducing the duty on products to 5% to equate it with the duty on crude.

Map 3-1 Petrochemical industry locations in India

Fertiliser

India is the third largest producer and consumer of fertilizers in the world with close to 60 large size plants in the country manufacturing a range of fertilizers. The most widely used fertilizers include nitrogenous (N), phosphatic (P) and potassic (K). Potassic fertilizer is not manufactured in India and is imported. The installed capacity of fertilizer industry in the country is about 12 m MT of nitrogen and 5.1 MT of phosphatic nutrients.

Urea (85% of N fertilizer consumption) constitutes 58% of the total fertilizer consumption in the country and Di-ammonium phosphate (DAP) accounts for approximately 66% of India's consumption of phosphatic fertilizers.

The industry relies heavily on imports for its requirement of raw material. Hence any devaluation of the rupee could inflate its import bill. Since the N-based fertilizers are protected by the retention price system (so far), the increased costs will affect P and K fertilizer manufacturers.

Natural Gas is used both as fuel and as a feedstock and constitutes as much as 40% of variable cost of manufacture. With increasing use of gas in other industries like power and petrochemicals, the fertilizer industry is facing a shortage of gas. Between 1980 and 2000, the prices of gas have gone up nine times, while the prices of urea have increased only three times.

Monsoon holds the key to the future prospects of the fertilizer industry. A good monsoon will spurt food grains production and consequently the demand for fertilizers.

Table 3-8 Nutrients consumption per Ha of arable land

Country	Nutrients consumption per hectare of arable land (kg)
South Korea	407
Japan	301
China	254
Bangladesh	156
Pakistan	135
India	98

Source: Equity Master, 2005

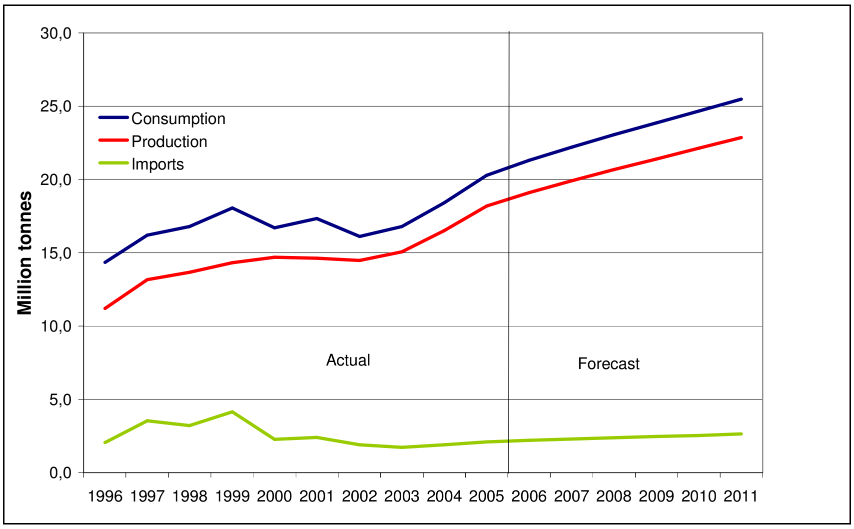
As can be seen from the table, India has one of the lowest per hectare of arable land consumption of nutrients. Urea demand is expected to reach 24 Mt by 2007. At the current capacity levels of 12 Mt, the demand supply gap is expected to be around 12 Mt. Moreover, if new capacities are not added, the gap is expected to mount further. The above factors indicate a huge potential of growth for the fertilizer industry.

The Long Term Fertilizer Policy announced by the government could have significant implications on the fertilizer industry going forward. While, in the medium term, it encourages the switch over from naphtha/fuel oil based units to gas based ones and creation of a regulator to allocate feedstock, over the long term it plans to withdraw the setting of selling price and concession scheme.

Around 30% of India's fertilizer production, which is based on naphtha and fuel oil, could become unviable, with the changes made in the new energy consumption norm. Only the gas-based units will be able to survive the deregulated era. The likely closure of many naphtha and fuel oil based units could disturb the demand supply position in the country and the Indian government may have to import its urea requirements at higher costs.

Consumption of finished fertiliser products has risen modestly over the past 10 years, at an average rate of 4% per year. Domestic production has risen faster than that, at over 6% per year, displacing import requirements. The FAI estimates that over the period through 2011-12, domestic consumption will rise by 3.7% per year, which is in line with the 11th Plan although the earlier years are expected to grow faster than the later years.

Figure 3-1 Consumption, production and imports of finished fertiliser 1996-2012



Source: FAI, Deli, July 2006 for actual through 2005-06 and consumption projection through 2011-12. Consultants have estimated the domestic production on the basis of the current share of total consumption to remain stable over the forecast period.

According to the 11th Plan targets for Fertiliser and Fertiliser raw materials imports, domestic production is seen to grow more or less in line with demand and no longer outpace the growth in demand.

3.1.4 Regional developments

Three states in India are of special interest to the port of Visakhapatnam, Orissa, Chhattisgarh and the home state of Andhra Pradesh. The following section aims at describing the main characteristics of the three states.

Orissa

The State of Orissa is committed to industrial development and stress is being laid on the exploitation of the rich agricultural, marine and mineral resources and tourism to provide the leverage for accelerated industrialization. The State of Orissa is considered to be the primary location for Metallurgical Industries.

- Agro-based industry based on grain production, fruit, vegetables, cereals, oilseeds, spices and condiments.
- Mineral industries build around large resources of power-grade coal, Iron Ore, Bauxite, Dolomite, Manganese Ore, Graphite and Chromites. Other important mineral resources include limestone, china clay, nickel ore, vanadiferrous, magnetite, and beach sands. The following table provides overview available mineral resources as a proportion of the national reserves.

Table 3-9 Mineral resources in Orissa

Mineral Resources	% of national reserves
Iron Ore	27%
Bauxite	70%
Nickel	95%
Chromites	98%
Coal	24%

- Manufacturing industries centres around steel, cement, sugar

Chhattisgarh

Chhattisgarh is one of the very few power surplus states of India and one of the richest Indian states in minerals. It is the hub for sponge iron, ferro alloys and steel re-rolling mills.

- Agro-based Industries consists of crops such as paddy, wheat, maize, groundnut, pulses and oilseeds, as well as forest products, such as timber and bamboo, which occupy 45 per cent of the area.
- Manufacturing Industries are taking advantage of vast deposits of iron ore, coal, lime stone and bauxite. Aluminium and explosive plants, as well as steel re-rolling mills, number of mini steel plants, ferro alloy units, steel/cast iron casting units, engineering & fabrication units are all active in the state.
- Mineral Industry takes advantage of the 28 known minerals the state, which makes Chhattisgarh one of the richest states in India in mineral wealth. The major sectors which are booming in this part of the country includes, power, iron & steel and aluminium. Other potential sectors of the region include diamond, alexandrite and tin. Chhattisgarh is also known for its rice mills, cement and steel plants.
- Power has become one of the major opportunities for the state. With huge coal reserves and cheap pithead power generation opportunities the state strategically located in central India is the destination for all power-intensive industries. Chhattisgarh has potential to produce up to 50,000 MW of power.

Andhra Pradesh

The state of Andhra Pradesh is primarily agro based. The key sectors identified, as per the contribution to SGDP in Andhra Pradesh are agro-based industries, pharmaceuticals, manufacturing, IT and textiles. Pharma industry in Andhra Pradesh contributes more than 1/3rd to the country's production. A new developing industry is the IT industry, which the State aims to develop to a national market share of 30 per cent by 2009. Andhra Pradesh contributes 25-30 per cent to India total seafood exports. It is a leading producer of cotton with an average production of 2.6 million bales annually. On a national scale Andhra Pradesh and Tamil Nadu account for 14 per cent of the national aggregate production of rice.

- Andhra Pradesh contributes 25 - 30 per cent to India total seafood exports. AP is a leading producer of cotton with an average production of 2.6 million bales annually. On a national scale Andhra Pradesh and Tamil Nadu account for 14% of the national aggregate production of rice. Agricultural production is growing at over 11% by volume. In 2004-05 the state produced 149.77 lakh metric tonnes of food grains. Production of oil seeds, groundnut and cotton accounted for 26.05 lakh metric tones, 16.60 metric tones and 27.39 lakh respectively. The industries in food products contribute 19.4% to total industrial production in the state. Andhra Pradesh ranks second in producing value added food products and beverages with 10 per cent share of total value added in the country.

- The sector's contribution to the state's GDP in 2004-05 was Rs. 2, 65,119 crore, or 17.33 per cent. In the period 2004-05 manufacturing production grew by over 25% by volume.
- The state contributes more than one third of the country's pharmaceutical production and the industry is growing at over 10% by volume. The projected production of pharmaceutical industry in AP will reach US$8 billion by the end of 2010. The state produces a majority of 500 basic drugs produced in India. Andhra Pradesh government is to develop an exclusive 'Pharma City' near Visakhapatnam with private sector participation to promote the pharmaceutical industry in the state. Pharma City cargoes are likely to go to Gangavaram port, which has been declared the gateway port for the project by the AP Govt
- IT exports from Andhra Pradesh have done well in 2005. It is expected to continue to grow at an annual rate of 30 per cent or more. The state aims to capture 30% of the national market share in the IT and ITES sector by 2009.
- The textile industry contributes nearly 20 per cent of the country's total industrial production and approximately 28-30 per cent of its total exports. It is growing at over 10% by volume. Cotton is the most important segment of the textile industry and accounts for nearly 55 per cent of domestic fibre consumption and nearly 90 per cent of total textile exports. The total exports values have increased by 14.1 per cent. The Indian textile industry aims to increase India's share in world's textile trade from the current 4 per cent to 8 per cent and to achieve export value of US $ 50 billion by 2010. The overall growth in textile industry is expected to be around US$ 85 billion by 2010.

3.2 Performance Indicators

3.2.1 Containers

Normal productivity of container terminals is indicated in Table 3-10 Performance depends mainly on:

- Ratio loaded vs. unloaded containers
- Unproductive moves
  The level of automation of the gantry-cranes
- The average weight of containers and the proportion of containers requiring special attention
- Commercial constraints

Table 3-10 Major North European Terminals – Container Productivity by Category

Port / Terminal	Container Gantry (TEU per unit)	Yard Area (TEU / ha)	Berth Length (TEU / m)
Primary Terminals	127,280	16,809	963
Secondary Terminals	117,321	16,201	703
All Terminals	124,390	16,638	874

3.2.2 Break Bulk / General Cargo

Due to the wide range of products, ships, equipment and methods, assuming an average performance for all kinds of commodities and packaging makes little sense. Specialized traffic like paper, frozen meat, fish or fruits should be studied separately. Most commodities in big bags, pre-slung or pre-palletized loads can be handled with a crane; a good organization should adapt to a rhythm of one cycle every 1.5 to 3 minutes (20 to 40 moves per hour). In the box below, examples are given for the handling of cement bags and exotic wood.

> *Two examples:*
>
> *Cements bags: 2 ton pallets built in the hold or on the apron: 40 ton/hour/crane. Pre-palletized bags: 80 ton/hour/crane, and more with spreaders. Cement in bulk can be handled at much higher speed.*
>
> *Exotic wood: logs up to 6-8 tons, handled by the piece with hydraulic clamps: 120 to 160 ton/hour/crane.*

3.2.3 Dry Bulk

Agri-Food Products / Fertilizers

Handling of export products is operated mainly with conveyors, whenever possible, with performances varying from 100 to nearly 1,000 ton/hour per conveyor, depending on ship size, port equipment, product characteristics and density, brittleness, and environmental and safety considerations linked to dust.

Ship to shore operations of import products require cranes and hoppers (20 to 35 ton capacity - 150 to 300 ton/hour), or elevators (400 to 1000 ton/hour): two to three cranes per ship, or one elevator and two or more cranes on Panamax and larger ships.

> *Example:*
>
> *Panamax to Cape-Size, 60,000 t Shipment: 1 elevator and 2 cranes per vessel results in 1,100 ton/hour, which equals 15 to 18,000 ton/day. The vessel can be handled in four days.*

Iron Ore / Coal

Export cargoes are usually loaded with conveyors; 1,000 to 2,000 ton/hour or more. Import traffic is handled with large gantry cranes geared with very large grabs: up to 1,000 ton/hour/gantry crane or with special devices. New developments in iron ore loading will lead to 8,000 ton /hour. For example the dry bulk terminal EECV in the Port of Rotterdam, is unloading coal at an rate of 3,000 ton/hour.

3.2.4 Liquid Bulk

Generally, unloading performances depend on the size of the ship, which provides pumps and energy. They depend also on its viscosity, temperature, and on safety regulations, for hazardous products. Most liquid carriers are operated within one day, whatever the size.

Table 3-11 Pump Capacity Liquid Bulk Tankers

Size of Tanker(DWT)	Pump Capacity (m³/hour)
200,000	12,000
100,000	7,000
50,000	4,500
25,000	3,500

Sources: Agerschou 2004

3.2.5 Development in the maritime industry

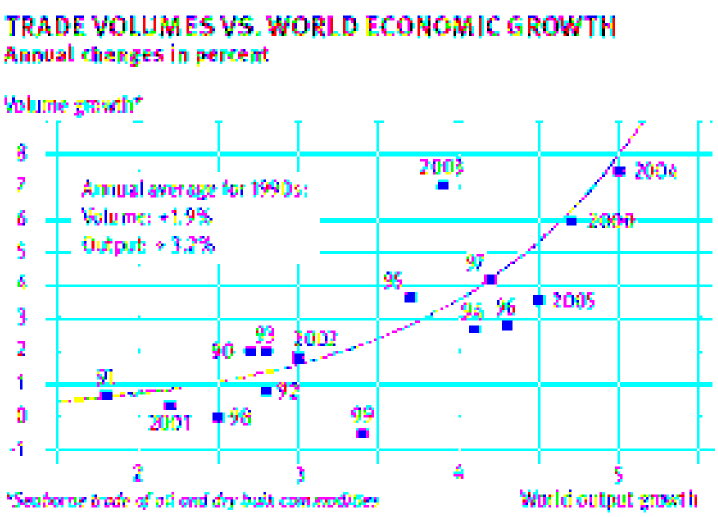
Tonnage demand

In 2003 and 2004 the demand for world merchant tonnage recorded extraordinary high growth rates of 9%. However, the growth rate fell to 6% in 2005. This 6% growth is in line with the average for the first six years of this decade, which compares to an average rate of growth of 3% in the 1990s. These estimates are made in compensated gross tons.

First, there has been a lift in the underlying long-term growth in the world economy, up from 3.3% per year on average in the 1990s to 3.9% so far in this decade. Second, there seems to have been a favourable shift in the relation between economic growth and seaborne trade. This could be explained by the fact that the distribution of growth in the world economy has gradually been more favourable for seaborne trade, predominantly with the growth of China and the related exports.

There thus is a double positive effect for the demand for tonnage. It is a result of important structural changes in world economy and trade, which most likely will continue for at least the rest of this decade. The liberalization of international trade in this decade has been of significant importance to the sharp rise in seaborne trade. If the policy is continued, then the most important premise for a continued strong expansion in global seaborne trade is established.

Figure 3-2



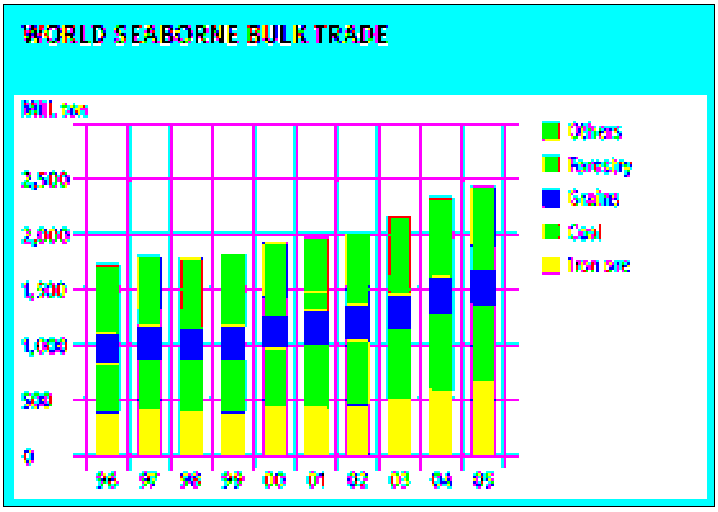
Source: R.S. Platou Annual Report

A dynamic and open Indian economy would have an important impact on the world economy. For international shipping India is also increasing its importance. Estimates are that India's oil imports accounts for 6% of the global total oil trade volumes, 2% of dry bulk import volumes (4% of dry bulk exports) and some 5% of the containerized trade.

Bulk markets

The bulk trade by sea has increased by well over 50% since 1996, to close to 2.5 Billion tonnes in 2005. Iron Ore trade has seen a rapid growth in the past few years, with the expansion of Chinese demand. Likewise, coal trade has seen rapid growth as coal fired power generation and the demands of the steel industry have increased.

Figure 3-3

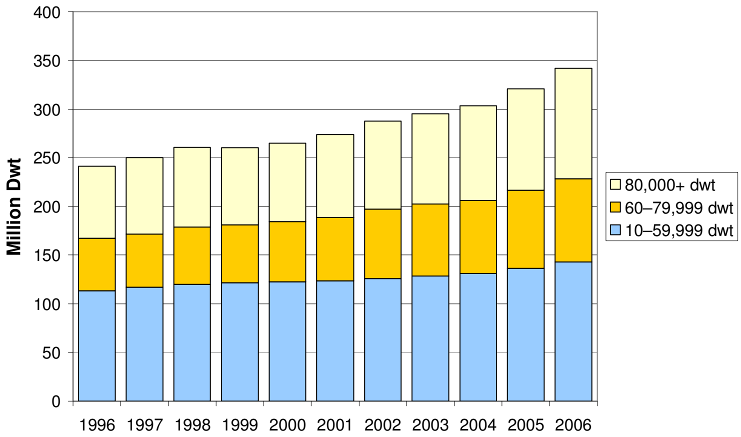


Source: R.S. Platou Annual Report

The bulk fleet has seen a move towards larger ships over the past 10 years, although the smaller sized vessels have increased their share of the global fleet considerably. In 2006, the fleet of vessels ranging between 10 and 60,000 DWT has raised from 113 Million DWT in 1996 to 143 Million DWT. The average growth rate has amounted to around 2.5% per year. The bigger vessel groups have seen average growth rates in the order of 5-6% annually, with an emphasis on bigger vessels in the latter years.

By now, the smaller sized vessels comprise 40% of the bulk fleet, whereas the 60-80,000 DWT vessels have a share of 25% of the fleet: the largest vessels of 80,000 DWT and up account for the balance of 33%, amounting to 113 Million DWT, up from 74 Million DWT in 1996.

Figure 3-4 Vessel size development of the bulk fleet



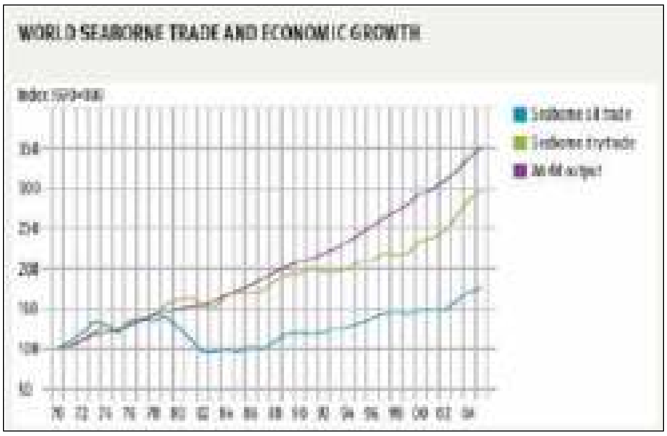
Source: R.S. Platou Annual Report

Risks for the medium term future

Since the US is the main driver in the world economy, shipping markets are especially vulnerable to corrections to the imbalances in the US economy. Some economists have warned against a US economic slowdown triggered by a weakening in private consumption, which accounts for two thirds of US GDP. Sooner or later there will be corrections to the imbalances in the US economy. A moderate slowdown in private consumption growth is possible and could reduce import growth from China, which immediately would be felt in the container market. This would then negatively affect imports of raw materials to China, which are of vital importance for the dry bulk as well as the tanker market.

Despite the permanent existence of certain risks, the world economy has been surprisingly robust for some years. So far the impact of higher oil prices on the global economy has been surprisingly weak. Most economists feared that sharply higher oil prices would result in a distinct slowdown in economic growth and in inflationary problems, even if it is obvious that the OECD countries are much less oil dependent than they were 20-30 years ago. The fact that previous energy crises have been driven by disruptions in oil supply, while this one has been demand driven in a period with strong economic growth, has been mentioned as an important explanation for the sustained economic activity. It has also been argued that the rise in energy prices this time has been more gradual, resulting in increased tolerance by consumers. In addition oil exporters' re-spending was already under way during the price rise period, underpinning economic activity both in their own countries and abroad.

Figure 3-5



Source: R.S. Platou Annual Report

3.2.6 Competing ports

Gangavaram

Gangavaram Port is centrally located along the East Coast of India around the Latitude 17° 37' N and Longitude 83° 14' E, about 15 kms south of Visakhapatnam Port. The port is being developed as all weather, deepwater, multi-purpose world-class port facility. It will offer major tangible benefits to Indian shippers and receivers through deeper drafts (20m), advanced cargo handling equipment, highly efficient operations, vast storage areas for all types of cargo and extensive ancillary facilities.

Map 3-2 port of Gangavaram

Gangavaram Port will be developed in three phases over the next 15-20 years. As per the master plan, the port will have 29 berths. It will be the deepest and only port in the country, which can accommodate larger vessels of even two lakh DWT (deadweight tonnage). The port will have a traffic potential of 27.4 MTPA in the short term and 103.3 MTPA in the long term. The costs of the project are indicated at Rs. 1,700-crore

In terms of impact of development of other ports on Visakhapatnam Port, the primary impact is from the development of Gangavaram. Port. Consultants have projected a loss of 11.5 million tons (5 million iron ore, 5.5 million coking coal and 1.0 million-steam coal.

Paradip

Paradip (20o 15' N / 86o 40’ E) is located on the Western shore of the Bay of Bengal, approx 6.5nm from the mouth of the Mahanadi River, 210nm S of Kolkata. The port has an artificial lagoon type-harbour protected by two rubble mound breakwaters. The draught varies from 11 to 17 meters, and plans exist for further dredging. Cargoes handled by the port include exports of thermal coal, iron ore, chrome ore, steel coils and containers carrying food products and imports include cooking coal, POL, fertiliser, phosphoric acid and hard coke.

The port consists of 14 berths, with a nominal capacity of 51.4 million. To meet the growing needs of these industries, the Port has taken advance action for development of port infrastructure facilities to increase its handling capacity to 100.00 Million tones by the year 2011-12 and the cargo for Export/Import is expected to grow to 70.0 Million tones per annum by that year.

Map 3-3 Port of *Paradip*

Kakinada

The Port of Kakinada consists of two ports:

- The old anchorage port (16o 59' N / 82o 19' E). It handles traditional cargo like agricultural products and fertilizers. Barges are deployed to load around 10,000 T per day. The port is expected to handle 3 Mt in 2006 - 07. The anchorage port is under the control of Roads and Buildings department of Andhra Pradesh
- The deepwater port. (16o 59' N / 82o 19' E) the facility has 11 M draft with three berths to handle handy max vessels. The port attracts vegetable oil cargoes, iron ore from Bellary belt and oil transhipment cargo. The 2006-2007: estimated traffic is 11 million tones of which Oil transhipment will account for 7 million tones. It is proposed to extend the draft to 12.5m initially and then to 14m in 3 years time. An additional berth and a port based SEZ are planned.
-

Map 3-4
Master Plan Map of Kakinada port

Kakinada is a multipurpose port. The imports consist of edible Oils, POL (Naphtha, HSD, SKO, Furnace Oil), Chemicals (Phosphoric Acid, Sulfuric Acid), Gases (Ammonia), Dry Cargo (Wood Pulp, Machineries) and Project Cargo (ODCs and Heavy Lifts). The export includes Iron Ore, Cement Clinker and Minerals (Bentonite, Feldspar) as well as lighterage of crude oil

Kakinada has developed an Offshore Supply Support Base. It has been a pioneer has been leading from the front in providing the best of the Marine and Supply Support base facilities.

Dhamra

Dhamra port under the Government of Orissa is located north of Paradip (20° 46' N / 86° 54' E). This port is being developed by a consortium of the Indian corporate giants Tata Steel and Larsen & Toubro as a deep water port to attract super max vessels of over 1,50,000 DWT and is expected to become operational from the year 2008-09. The cargo targeted is coking coal for SAIL's steel plants at Bhilai, Bokaro and Rourkela, currently being routed through VPT, and imports and exports from Tata's own proposed steel plant nearly.

Krisnapatnam

This port, also under the Govt of AP is located north of Chennai at the southern end of the Andhra coast, (140 15' N / 800 08' E). Navayuga Engineering Company is constructing a deep water port in Krishnapatnam with a draft of 16 m. Phase I is to be completed by March 2007, with one berth and Phase II with 3 berths to be completed by 2009-10 to handle 8 million tonnes.

The Cargo targeted is more than 8 Mt of Bellary iron ore currently being exported through Chennai and imports of coal for proposed thermal plants in the region. The port is expected to handle around 2 million T by 2008-09.

Krishnapatnam port is partnering with the Andhra Pradesh government and Indian Railways for a rail link from the Kolkata-Chennai and Mumbai-Chennai main lines to the port. Land acquisition has already started for the project.

Gopalpur

(19° 18' N / 84° 58' E)

Situated at the southern end of Orissa coast between Visakhapatnam and Paradip ports near Berhampur on NH5, Gopalpur port was operated till recently as a seasonal anchorage port. It is now being developed as a deep water port by Orissa Stevedores Ltd., with a draft of 14 m in Phase I to handle super max vessels for bulk cargo. Phase I is expected to be completed for operations on full scale during the year 2009-10.

Nizampatnam

(15°. 54' N / 80°. 43' E)

Nizampatnam will be the third green-field port to be developed on the coast of Andhra Pradesh after Gangavaram. Skoda Export Company, a Czech government owned company will be building the Nizampatnam Port complex situated at Krishna river's drainage outlet south-east of Vijayawada of Andhra Pradesh, equidistant from Chennai and Visakhapatnam at an estimated cost of about Rs.4500 crore by 2010.

Also proposed are the developments of a multi-product special economic zone and assorted infrastructure along with a urea manufacturing facility and a power plant of 250 MW to cater to the power requirements to the Nizampatnam Port city complex and to sell the power to the Power Trading Corporation.

Summary

The table below gives an overview of the main characteristics of the competing ports.

Table 3-12 The competing ports in short

Port	Draught	Specialization	Capacity
Paradip	13m	mechanized bulk,	55/100 Mt
Dhamra	16m	green field dedicated	10/30 Mt
Gangavaram	18-20m	green field, multi,(2008)	10/125 Mt
Krishnapatnam		green field (2008)	20/40 Mt
Kakinada	11.5m	multi, offshore	15 Mt

A major threat for VPT are the private ports along the same coast, of which Gangavaram, on a stone's throw from VPT, seems to be the competitor to be taken especially seriously. This private port could take away coking coal and other cargo from Visakhapatnam.

Paradip, which plans to develop 5 captive berths, may eat away Visakhapatnam's share of coking coal, steam coal and limestone. Containers from Paradip's hinterland, now coming to VPT, may also move to Paradip when its container and multi purpose general cargo facilities are developed. Dhamra poses the danger of attracting a SAIL's cargo, which now comes to Visakhapatnam.

The following table illustrates the comparison position of bulk handling facilities at Visakhapatnam vis-à-vis other existing competing ports handling major bulk cargoes

<table>
<tr><th>Commodity</th><th>Port</th><th>Berth length in M (No)</th><th>Draft at Berth in M</th><th>Max Vessel Size in DWT</th></tr>
<tr><td rowspan="4">Iron Ore</td><td>Visakhapatnam</td><td>540 (2)</td><td>16.50</td><td>150,000</td></tr>
<tr><td>Haldia (Kolkata)</td><td>337 (1)</td><td>Riverine port</td><td>30,000</td></tr>
<tr><td>Paradip</td><td>155 (1)</td><td>13.20</td><td>65,000</td></tr>
<tr><td>Chennai</td><td>382 (1)</td><td>17.40</td><td>150,000</td></tr>
<tr><td rowspan="4">Coal</td><td>Visakhapatnam</td><td>No dedicated berth</td><td>14.50 (OH)
10.21 (IH)</td><td></td></tr>
<tr><td>Haldia (Kolkata)</td><td>284 (1) Thermal
245 (1) Coking
GCB</td><td>Riverine port</td><td></td></tr>
<tr><td>Paradip</td><td>520 (2)</td><td>15.00</td><td></td></tr>
<tr><td>Chennai</td><td>218 (1)</td><td>11.00 (IH)</td><td></td></tr>
<tr><td rowspan="4">Fertilizers</td><td>Visakhapatnam</td><td>168 (1)</td><td>10.06</td><td>35,000</td></tr>
<tr><td>Haldia (Kolkata)</td><td>No dedicated berth</td><td>Riverine port</td><td>60,000</td></tr>
<tr><td>Paradip</td><td>230 (1)</td><td>13.00</td><td>60,000</td></tr>
<tr><td>Chennai</td><td>No dedicated berth</td><td>11.00 (IH)</td><td>40,000</td></tr>
</table>

3.3 Traffic forecast for the years 2006/07 – 2012/13

3.3.1 Iron Ore

At present, the reserves of relatively rich iron ore in India are 11.43 billion tonnes of haematite (8.7% high-grade) and 10.68 billion tonnes of magnetite ores. Commercial mining capacity for iron ore is 175 MT^3 (estimates of the Federation of Indian Mining Industries (FIMI)), of which 145 MT^3 (83%) was used in 2004-05. 54 mT3 of production was consumed domestically, 145 MT^3 was exported. Currently, fines and concentrates make up about 90% of Indian iron ore exports. The growth of exports of fines is likely to decline and exports of iron ore (especially high-graded lumps) would be leveraged for imports of coking coal, for investment in India and the needs of local industry.

Potential port demand

After liberalization of the economy, the Indian steel industry has become highly dependent on port infrastructure both in terms of imports of critical input materials like coal and coke and export of saleable steel. Keeping in view the strategic goal of achieving a production of 110 Mt of steel per annum and an annual export level of 26 Mt by 2019/20, the port facilities would also have to be expanded substantially. The projected bulk to be handled at ports is shown below:

Table 3-13 Growth in Port Traffic, 2004/05 to 2019/20 (in Mt)

Bulk to be handled at ports (Mt)							CAGR
	2004/05			2019/20			
	Import	Export	Total	Import	Export	Total	
Raw Materials*	19.3	78.0	97.3	85.0	100.0	185.0	4.4%
Steel	2.0	4.0	6.0	6.0	26.0	32.0	11.8%
Total	21.3	82.0	103.3	91.0	126.0	217.0	5.1%

*Including iron ore.
Source: National Steel Policy Document, November 2005

The current Government policy allows private capital in port development. Steel producers are encouraged to develop port and berth facilities so as to improve productivity, turn around time, the capacity to handle larger vessels and other operational parameters of efficiency. There is clear evidence that the private sector is taking up the gauntlet and ports are being constructed at many places. In the case of Visakhapatnam, this is evidently the case to the letter of the policy, with the new deep water Gangavaram Port. The entity is part-owned by the government owned local steel plant RINL, while private parties participate as well.

The bulk of capacity augmentation has to be undertaken through public private partnership and captive users. This different set-up requires a clear and comprehensive framework for private sector participation.

Main customers

NMDC, incorporated in 1958, as a fully owned public enterprise is under the administrative control of the Ministry of Steel, Government of India. Since inception NMDC is involved in the exploration of wide range of minerals including iron ore, copper, rock phosphate, lime stone, dolomite, gypsum, betonite, magnesite, diamond, tin, tungsten, graphite, beach sands etc. NMDC is the country's single largest iron ore producer and exporter, in 2004/05 produced 20.74 Mt tons of iron ore from its 3 fully mechanized mines viz., Bailadila Deposit-14/11C, Bailadila Deposit-5, 10/11A in the State of Chhattisgarh and Donimalai Iron Ore Mines in Karnataka State. NMDC is presently producing about 15.75 million tons of iron ore from its Bailadila sector mines and 5.02 million tons from Donimalai sector mine.

Because of its excellent chemical and metallurgical properties, the calibrated ore from Bailadila deposits has substituted the iron ore pellets in sponge iron making and hence became an important raw material for three major gas-based sponge iron steel producers like Essar Steel, Ispat Industries and Vikram Ispat. In addition to these three, the entire requirement of the Visakhapatnam Steel Plant is also being met from Bailadila. Besides these steel plants, trading companies engaged in exports of ore such as MMTC also source their ore from NMDC mines.

The demand for steel will continue to grow in the years to come and this in turn would call for increased demand for iron ore. NMDC is gearing itself to meet the expected increase in demand by opening up new mines – Deposit-10&11A in Bailadila sector and Kumaraswamy in Donimalai sector and this would add in allowing the production capability to reach around 23 million tonnes per year.

Ultra Pure Feric Oxide (UPFO) Plant at Visakhapatnam - The construction of the UPFO Plant at Vizag was completed and the plant operated for a brief period of 16.01.2004 till 31.3.2004. Thereafter, the operations of the plant have been discontinued for want of market tie up.

NMDC's network of activities may be seen on the following map.

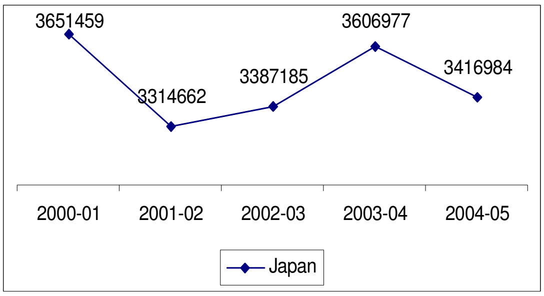
Map 3-5 NMDC's Activities in India

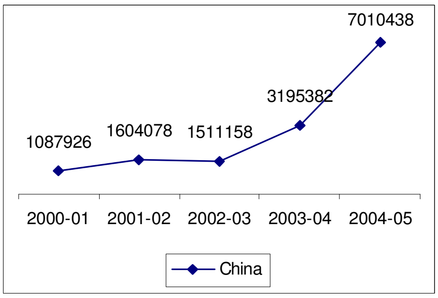
Besides NMDC / MMTC, there are numerous shippers of iron ore cargo that includes Ispat Industries, Vikram Ispat, Adani Exports, Rungta, Essel Mining, Core Minerals, Taurian, and presently offering collectively around 5.0 Mt per annum to VPT. The ESSAR group also handles iron ore cargo in pellets, mostly on coastal trade, through VPT to the tune of 4 million T per annum. This is bound to increase in the coming years as they expand their capacity at Bailidaila Mines.

The throughput of iron ore

The main origins of this cargo are Kirondal and Bacheli of the Bailadila belt in Chhattisgarh and Hospet-Bellary belt in Karnataka. While crude lumps, slurry and fines are sourced from Bailadila, iron ore fines are sourced from Bellary. The prime destination countries are Japan and China. Exports to Japan through Visakhapatnam, primarily by MMTC, has remained in the range of 3-4 Mt per annum. The growth in traffic of this commodity has been as a result of the booming steel industry in China. Exports to China have seen remarkable 7 fold growth from 1.0 Mt in 2000-01 to 7 Mt 2004-05. The trend is likely to continue as is evident from the fact that China has emerged in 2006 as the largest exporter of steel in the world overtaking Japan. The trend observed may be seen from the following charts.

Figure 3-6 Trends in expert of ore (in tonnes) to China and Japan through Visakhapatnam port





Currently, the port handles around 16 Mt of Iron Ore and Pellets. That is up from 12.2 Mt in 2003-4. Although exports rose nearly 50% between 2003-04 and 2004-05, with China taking 8 Mt alone, in 2005-06, exports had fallen to 9.9 Mt, with Coastal traffic increasing 10% year on year. ESSAR Steel (HGPL) and ISPAT Industries are the main coastal exporters. The average parcel size has been more or less stable in 2005-06, compared to 2004-05. The number of exporters is increasing, suggesting that the average parcel size may fall, so that the distribution of vessel sizes will become skewed.

The prospects for iron ore

The following trends are foreseen by the major companies:

- **MMTC:** Exports by NMDC/MMTC through Visakhapatnam port is likely to be about 3.0 Mt through the period to 2012-13
- **Essar Steel:** Exports of pellets are expected to increase to 9.0 Mt by 2012-13 Mt and crude lump ore (CLO) to 3.0 Mt by 2012-13
- **ISPAT Industries:** Exports by IIL is set to double over the next 2 years from the current level of 1.5 Mt and double again by 2012-13 to 6.0 Mt
- **Others:** this includes firms such as Prathybsha, Taurian, Merchant Shipping and Rungta Mines etc. In the face of the overall export restrictions envisaged in the national steel plan, the smaller parties are assumed to grow at the same rate as the national average.

A potential loss of cargo could be materialised due to:

- The MMTC exports under trade with Japan might be lost, if the client wants to use 200,000 DWT vessels for their specific trade, for which a lengthening of the Ore Berth is required. However, Gangavaram will be able to provide these facilities from 2008-09 onwards. Here, a potential loss of trade is very possible.
- If the proposed investments in steel industry in Orissa and Chhattisgarh materialize, there would be increased consumption in the domestic market and restraint in exports. Moreover, the exports from Bellary-Hospet belt through Visakhapatnam port may decline due to diversion to other ports like Krishnapatnam and/or Kakinada to about 1.0 to 2.0 Mt.
- The export policy from the Government of India could limit the exports due to the fact that strong development of the Indian iron and steel industry can be hampered. At present the low grades are mainly exported and the high grades are consumed in India.

Based on the trends presented above the potential traffic for Iron Ore and Pellets is presented in the following table.

Table 3-14 The export potential for iron ore and pellets (in Mt)

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
MMTC	4,71	3,0	3,0	3,0	3,0	3,0	3,0	3,0
ISPAT Industries	1,52	1,5	2,0	3,0	3,0	3,5	4,0	5,0
Essar Steel (HyGrade)	4,1	7,5	7,5	7,5	9,0	9,0	9,0	11,0
Vikaram Ispat	0,47	0,5	0,5	1,0	1,0	1,0	1,0	1,0
Others	5,15	5,0	4,5	4,5	4,0	3,5	3,0	3,0
Iron Ore exports total (Mt)	15,95	17,5	17,5	19,0	20,0	20,0	20,0	23,0
Potential loss to Gangavaram	0	0	0	3,0	3,5	4,0	4,5	5,0
Remaining for Vizak	15,95	17,5	17,5	16,0	16,5	16,0	15,5	18,0
Average parcel size (Kton)	52	55	60	60	60	60	60	60
No. of calls	307	318	292	267	275	267	258	300

Note: average parcel size for smaller parties held constant at 30 tons, assuming part cargoes in same vessels, although no direct data is available for this figure

The table shows that in the high scenario about 23.0 Mt is foreseen for the exports of iron and pellets. Especially the export of Ispat and Essar are the main drivers behind the future growth, which comprises partly domestic demand and as such coastal traffic. As mentioned before a possible shift of cargo to Gangavaram could occur and is estimated at 5.0 Mt in case the port of Visakhapatnam will not be able to handle cape size vessels, e.g. the export potential for the Far East. For the planning period the forecast for iron ore and pellets will range from 18.0 to 23.0 Mt.

The potential for the long term (2025) depends on the investment in a Cape size facility, estimated at maximum of 25.0 Mt and the bulk export facility to be constructed in the inner for the export of bulk cargo with a maximum capacity of 6.0 Mt.

3.3.2 Coal

Coal production is nationalised at present and private investment in coal mining is only allowed for captive mines supplying coal to designated sectors, power, steel and cement. Taking a longer-term view of energy production there is a strong case for denationalising coal so that private sector investment can come into this crucial area.

Coking Coal

The proven reserves of prime coking coal are only 4.6 billion tonnes. The production of coal was 328 Mt in 2001-02, out of which coking coal amounted to only 29Mt. Indian coking coal usually lacks the quality needed for steel production. The production of low ash coking coal required by steel makers was around 10 Mt in that year. Poor quality domestic coking coal thus has to be blended with imported coal. Currently, imports to an amount of 19 Mt are blended with 7.5 Mt from indigenous sources. By 2020, about 70 Mt of coking coal will be required, of which 85% or 60 Mt will have to be imported.

The imports of coking coal are mainly imported by Steel Authority of India Ltd (SAIL) and Visakhapatnam Steel Plant (VSP). Of the 7.1 Million tons imported, these two companies account for 6.8 Million tonnes. With such a large dependence on these two clients, a trend forecast would ignore the realities of the business decisions by these companies, even though their requirements for raw materials are likely to follow the trend.

As the national plan is to double steel production by 2020, both SAIL and VSP have substantial expansion plans. However, SAIL has a different set-up for the future than its current distribution of production, resulting in below-trend Visakhapatnam-related traffic. VSP on the other hand is partner in the Gangavaram port project; so that it is certain that once the port is opened the related cargoes will be lost. Each company will be discussed in more detail below.

SAIL

The company's current capacity is 11 Mt of finished steel, amounting to 12.5 Mt of crude steel. It has a total of 5 integrated steel plants, of following capacity: 2.0 of 4.5 Mt, 2.0 of 1.8 and 1.0 of 0.5 Mt (this latter was recently acquired through buying ISP). This capacity is to grow to 20 Mt by 2012, or an average growth of 8.5% per year for the coming period. It will increase its capacity by de-bottlenecking and some additional finishing mills. Furthermore, SAIL exports around 0.5 MT of finished products from Visakhapatnam. The total import of Coking Coal for this process is expected as presented in the table below.

Table 3-15 The future cargo handled by SAIL (in Mt)

	2005/6	2006/7	2012/2013
Visakhapatnam	4.0	5.0	5.5
Haldia/Paradip	5.9	6.0	10.5
Total imports	9.9	11.0	16.0

Visakhapatnam remains the first port of call. The cargoes arrive in Handymax and Panamax size vessels. The vessels are topped off at the GCB at Visakhapatnam, after which the vessel is shifted to the berths in the Inner Harbour. The shifting is done in order to free up space at the GCB for vessels waiting at the anchorage and to arrive at draft limitations of the Inner Harbour. In the Inner Harbour, the unloading for Visakhapatnam is done until the vessel reaches the draft limitations of Haldia (7-8.5 M) after which it leaves for Haldia and Paradip. The Handymaxes typically discharge 12-14 KT at the GCB and a further 8-9 at the IH. The Panamaxes discharge 35 KT at the GCB and another 10 KT at the Inner Harbour.

Currently, SAIL has 15-16 vessels per month calling at Visakhapatnam. The average size of the vessels is currently around 46,000 DWT, carrying an average of 34,000 tons for discharge at Visakhapatnam. The increasing amounts of cargo will like result in a shift to bigger vessels. Part of the current Handymax will shift to Panamax-size and part of the Panamax loads to Capesize. However, SAIL has experimented 2 times with Capesize vessels and then load in smaller vessels. It has found that the positioning of the “feeder” vessels was problematic. Still, an integrated Capesize and dedicated barges operation is feasible, though not fully considered as yet. For the purpose of this business plan forecast, average parcel sizes are assumed to increase to 45,000 and then further to 50,000 tons, reflecting the shift to bigger vessels.

The expected increase in cargoes will lead to increased traffic in the port of Visakhapatnam, although the majority of the increment is destined for Haldia. SAIL has entered into an MOU with VSPL to handle the coal imports at the EQ8 berth, around 3 Mt, while still topping off in the Outer Harbour (in case no adjustments take place in the port).

VPT is considered to be cheap. SAIL pays 0.5 USD per ton for wharfage and around 1 USD per tonne for handling and stevedoring into the rake. However, these low costs are complicating the logistics within the port and the restrictions of size. (SAIL would require 14m-vessel draft). Furthermore, the traffic management is not optimal and the mechanisation of the GCB would be much preferred.

The company could consider moving to Gangavaram if and when that port opens and have sufficient capacity for SAIL. With the switch of VSP to Gangavaram, the switch of SAIL might not be feasible over most of this business plan period, given insufficient coal handling capacity at Gangavaram from its first phase (which is estimated at 5 Mt). By 2010/11, this switch may become feasible if current handling facilities have not improved at Visakhapatnam and there is sufficient capacity at Gangavaram. Capesize loads will become increasingly attractive for SAIL as imports increase.

Visakhapatnam Steel Plant

Visakhapatnam Steel Plant, known also under RINL, has a current capacity of 3 Million tonnes of liquid steel, although it has been producing above 20% of this rated capacity in the last year. It uses around 3.0 Mt of coking coal, of which 80% is imported, or 2.4 Mt. The capacity is being expanded; resulting in an approximate increase of 800 thousand tonnes of coking coal imports on an annual basis after the plant has become operational in late 2006. As with SAIL, VSP is increasing its production capacity further, in line with the national plan. The company foresees a production expansion of 3.3 Mt by 2008-09. Coking coal requirements increase by 3.8 Mt, of which 80% will likely be imported. That implies a further 3.0 Mt of coking coal imports. In the longer term the company plans to expand capacity to 15.0 Mt.

The company is actively seeking a mine outside India to fulfil this need. With the expansion, the company seeks to use Capesize vessels of 110,000 DWT. Currently, Handymax and Panamax vessels are being used with a total of 7 - 8 calls per month at Visakhapatnam for discharging the coal.

Given above plans, the company's participation in the new port at Gangavaram is plausible. The planned cargo increases will make a dedicated berth very attractive indeed, which will be located very near to the plants.

For Visakhapatnam, the implications are straightforward. All cargo will go from 2008 onwards to the new port when it opens. That will imply a loss of around 2.5 Mt of cargo and no share in the growth either. Related products such as limestone are likely to leave as well. At the same time, given the phased development of the new port and its planned initial capacity, it seems unlikely that much other coking coal cargo will be lost, as there will be too little capacity to handle the cargo, since VSP alone will handle around 5.5 Mt by the time the berths open. No further information is yet available as to when the second berth opens.

For the business plan, the coking coal requirement is held stable at 3.0 Mt until the plant opens, then rises to 5.5 Mt and is held stable at that level for the remainder of the period, in the absence of information on detailed expansions. Furthermore, it is envisaged that from 2008/9 all cargo is lost to Gangavaram.

Smaller trading companies

The smaller companies are projected to increase their imports as per the national trend, assuming that current parties will expand activity and that new users will also appear. This implies an average annual growth rate of 7%, based on the National Steel Policy's document. Current throughput is 0.3 Mt, so that by 2012/13, throughput would be 0.45 Mt. it is not envisaged that much of this cargo will leak to the new port, as the parcel sizes are comparatively small and little capacity will be available at Gangavaram. Besides, VPT is cheap, and for smaller parties this can be an overriding argument, especially when handling is sped up. Traffic indicated in responses by GMR Industries, Jayaswals Neco, Indian Metals and Ferro Alloys Ltd etc., have also been taken into account under 'other parties'

Summary Coking Coal

The table below sums up the findings from the above paragraphs.

Table 3-16 Summary coking coal imports (in Mt)

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Users:								
SAIL	4.1	4.1	4.2	4.4	4.6	4.8	5.0	5.5
VSP/RINL	2.8	2.9	3.0	5.0	5.5	5.5	5.5	5.5
Smaller parties	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5
Coking coal imports total (Mt)	7.2	7.3	7.5	9.8	10.5	10.7	11.0	11.5
Potential loss to Gangavaram	0	0	0	2.8	4.3	5.0	5.0	5.0
Remaining for Vizak	7.2	7.3	7.5	7.0	6.2	5.7	6.0	6.5
Average parcel size	36	36	45	45	50	50	50	50
Approx. No. of calls	197	203	167	156	124	114	120	130

Note: average parcel size for smaller parties held constant at 20000 tons, assuming part cargoes in same vessels, although no direct data is available for this figure.

The table shows that the potential traffic for the Port of Visakhapatnam could grow from 7.2 Mt in 2005/06up to 11.5 Mt in the planning period. Due to the fact that RNIL is a stakeholder in the new port of Gangavaram a potential loss of about 5.0 Mt is foreseen in the year 2012/13.
In the long term the prospects for the handling of coking coal depends on the development in the iron and steel sector in the catchment area of the port. Based on trend extrapolation the future demand in the year 2025/25 could range from 15.0 to 20.0 Mt.

Non-coking coal
Coal will remain to be the primary source of commercial energy and total demand for coal is projected to increase from 432 Mt in 2005-06 to 670 Mt in 2011-12. With proven reserves of 74 billion tonnes, non-coking coal constitutes around 82% of the total coal reserves in India. For the medium term it is estimated in the 11th Plan that India may need to import 40-50 Mt of superior grade thermal coal by the end of the plan period. Thermal power stations on the Southern and Western coasts can be competitive using imported coal and the country's electricity requirement justifies such import. This requires necessary port handling capacity and coast based power generation capacity of around 12,000 to 15,000 MW to absorb the thermal coal imports.

Sponge iron grade non-coking coal
The sponge iron industry using non-coking coal as input material will play an important role in substituting coke. The capacity of sponge iron industry is set to increase from the current 13 Mt to 20 Mt by the end of 2010-11 (growth rate of 6.5% per year), and to 38 Mt by 2020. The current trends indicate that a large number of sponge iron based steel units may come up in the states of Orissa and Jharkhand. By 2019-20 the steel industry will demand around 26 Mt of non-coking coal of higher grades.

Thermal Coal Exports
The exports of thermal coal are linked to Chennai/Ennore for the TNEB. The coal originates at the Talcher mines and Singareni mines. Coal from Singareni is shipped in its entirety via rail to the south. The main reason that the coal is not transported in its entirety via rail to Chennai is that the current logistic set-up allows the economic use of rakes by Indian Railways. Given the distance and the amounts to be shipped, a substantial investment in rakes would be required to provide capacity. In the current set-up, coking coal loaded in VPT is taken as a return cargo by the railways.

The power situation in Tamil Nadu is likely to witness a dramatic change once the 2x1,000 MW atomic power station at Kudangulam near Tuticorin goes on stream, addition of 500 MW fast breeder reactor to the existing capacity of 2x220 MW at Kalpakkam atomic power station and expansion of TPS II at Neyveli from 1,470 MW to 1,970 MW also materialize. These expansions will reduce the demand for thermal coal, lowering throughput at Visakhapatnam. However, NLC has proposed a 1,000 MW capacity power plant at Tuticorin using Coal as the feed stock, will result in increased coastal movement of thermal coal that might be beneficial for the port of Visakhapatnam.

The average parcel size for TNEB varies between 30-35,000 tons, which is currently around the maximum that can be handled at the west quays with the applicable depth restrictions. Average ship size is around 26-27,000 GRT, or around 47,000 DWT, indicating part loading only for these cargoes. As the Inner Harbour is being dredged to allow draft of 12.5 meters, these restrictions will be lifted. This will result in fewer vessel calls at static throughput. Given current loading practices, the amount of berth days will not change.

For the current business plan, the exports have been based on TNEB's indications of future requirements being routed through Visakhapatnam Port. This also reflects the need for dramatic improvement in logistics due to proposed developments at Visakhapatnam.

Table 3-17 Prospects for thermal Coal

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Thermal Coal exports (Mt)	2.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Average parcel size	33	33	45	45	45	45	45	45
No. of calls	82	91	67	67	67	67	67	67

Although the railways have return cargo, the possibility exists that this cargo flow will be allocated via Paradip in case the railway connection between the mines and Paradip is improved. The connection is expected to be operational as of 2009. Other potential flows for thermal coal are not foreseen as the proposed thermal power stations in the service area of Visakhapatnam Port i.e., the states such as Chattisgarh are slated to come up at pit heads of coal mines in the state. The forecast for thermal coal ranges from 3.0 Mt in the high scenario to nil in case the cargo flow will be re-routed via Paradip.

Steam coal

Steam coal is routed through VPT mostly for trading. The clients includes Coastal Energy, Bhatia, Agarwal, Mahesawari etc. Manufacturing plants include clients like NTPC, HGPL, Essar Steel'.

In case the HPCL expands its refinery capacity to 15.0 Mt, there is a need for a 1,000 MW power station, which requires about 3.0 Mt of steam coal. This investment could be operational towards the end of the planning period of the business plan. The first year of operations will be around 2011/2012.

Table 3-18 The future imports of steam coal (MT)

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Main users								
Traders		1.0	1.5	1.8	2.0	2.0	2.0	2.0
Mfg plants		0.5	0.7	0.9	0.5	0.8	1.1	1.3
Steam coal imports total	2.0	1.5	2.2	2.7	2.5	2.8	3.1	3.3
Potential loss to Gangavaram	---	---	----	0.4	0.6	0.8	0.9	1.0
Remaining for Vizak	**2.0**	**1.5**	**2.2**	**2.3**	**1.9**	**2.0**	**2.2**	**2.3**
Average parcel size ('000)	30	32	36	40	40	40	40	40
No. of calls	67	47	61	58	48	50	55	58

Note: The parcel size of vessels used by traders is 45000 to 55000 whereas by manufacturing plants (end users) it is 20,000 to 25,000

For the planning period, the high forecast for the imports of steam coal amounts to a throughput level of 3.3 Mt. Due to the new investment in Gangavaram a loss of cargo of about 1.0 Mt could occur. This implies that the future throughput will range from 2.3 Mt to 3.3 Mt for the year 2012/13. At the end an additional 3.0 Mt could be imported in case the power plant for HPCL will be constructed. The potential vessel will probably be Panamax size, which will increase the number of calls with 40 additional calls.

For the long term, the imports of steam coal could increase in case new investments in power plants, the iron and steel industry come on stream.

Coke: Met Coke, Pet coke, Lam coke

RINL imports Met Coke with a parcel size of 30,000 and the total annual throughput is around 0.25 Mt. Other small importers like Dunkuni Steels are importing with smaller vessels. It may continue. Once Gangavaram becomes operational, RINL is likely to shift this cargo to Gangavaram port. Pet coke is being imported by Rain Calcining Ltd., and the same is calcined at Visakhapatnam facilities and is re-exported as calcined Pet coke to various destinations. The relation between imports versus exports of Pet coke and CPCoke is roughly in the ratio of 3:2. Accordingly, RCL's traffic would be 2.0 Mt of Petcoke imports and 1.2 Mt of CPCoke exports totalling to 3.2 Mt of handling of combined cargo flows by 2012-13. Lam coke is currently being imported by Jayswal Neco Ltd. to the tune of 0.45 Mt in parcel size of 30,000 tonnes. The traffic on account of this user is expected to grow to 0.7 Mt by 2012-13 as learnt during interviews with them. No expansion plans have been revealed by them in their responses and hence projections do not account for any expansion by JNL. The projections are based on results of interviews with port users for various commodities are given in the table below.

Table 3-19 The future throughput for Coke (MT)

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Pet coke Import	0.8	0.8	0.9	1.0	1.2	1.5	1.8	2.0
Calcined pet coke Exports	0.4	0.45	0.5	0.65	0.75	1.0	1.1	1.2
Lam coke Import	0.45	0.5	0.5	0.55	0.55	0.6	0.65	0.7
Total	1.65	1.75	1.9	2.1	2.5	3.1	3.55	3.9
Ship calls	55	58	63	70	83	103	118	130

3.3.3 Fertilisers

India is the 3rd largest producer and consumer of fertilizers in the world. The fertilizer industry has a capacity of about 12 Mt of nitrogenous and 5.1 Mt of phosphatic nutrients. Raw materials are mainly imported. Natural Gas is used both as fuel and as a feedstock and constitutes as much as 40% of variable cost of manufacture. With increasing use of gas in other industries like power and petrochemicals, the fertilizer industry is facing a shortage of gas.

Urea (85% of nitrogenous fertilizer consumption) constitutes 58% of the total fertilizer consumption in the country and Di-ammonium phosphate (DAP) accounts for approximately 66% of India's consumption of phosphatic fertilizers.

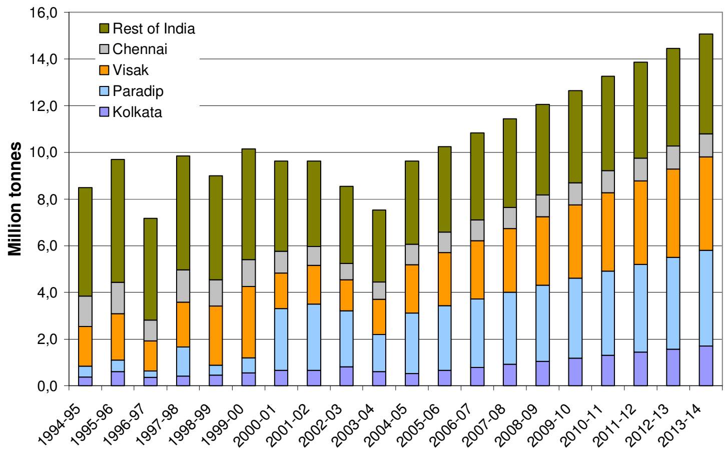
Around 30% of India's fertilizer production, which is based on naphtha and fuel oil, could become unviable with a proposed shift to gas-based production. Only the gas-based units will be able to survive the deregulated era. The likely closure of many naphtha and fuel oil based units could disturb the demand supply position in the country and the Indian government may have to import its urea requirements at higher costs.

Consumption of finished fertiliser products has risen modestly over the past 10 years, at an average rate of 4% per year. Domestic production has risen faster than that, at over 6% per year, displacing import requirements. The FAI estimates that until 2011-12 domestic consumption will rise by 3.7% per year.

Fertilisers and Fertilizer Raw Materials

The imports are envisaged to grow much faster though on the East Coast of India, as production capacity is installed, as is witnessed at the Coramandel Fertiliser Plant. By the end of the Plan Period, the East Coast major ports (Chennai, Visakhapatnam, Paradip and Kolkata) are expected to account for 72% of all imports in India. That compares to 66% currently.

Figure 3-7 Actual and planned imports of fertiliser and fertiliser raw materials



Source: Indian Ports Association and 11th Plan

Visakhapatnam is expected to lose relative share, but that is of a growing market. Given the low use of fertiliser per head, these projections may be conservative. With the ongoing industrial development, it is likely that a quicker pace of agricultural development follows towards the latter half of the plan period and then into the medium to longer term. Indeed, production on the East Coast is expected to be stepped up with the arrival of gas. British Gas for instance envisages a 70% growth to 2012 in gas-based fertiliser plants in India. With the Krishna Godavari gas fields in front of Andhra Pradesh it is very likely that quite a few plants will be developed in the region. However, this development is not immediate and the creation of a gas distribution system will take considerable time. Indeed, if domestic production does not grow fast enough, imports will be substantially higher.

Coramandel fertilizers are the major port users in this category importing finished fertilizers as well as raw materials. Other important users are Godavari Fertilizers, Indian Potash Limited, Krishak Bharati Cooperative (KRIBHCO) and Indian Farmers & Fertilizers (IFFCO).

The following products are included: Urea, DAP and MAP as most important finished fertiliser products (2.3 Mt) and rock phosphate (0.7 Mt) and sulphur as raw material (0.9Mt). Liquid ammonia will be part of the liquid chemicals.

For the plan period it is to be expected that the fertilizer throughput increases from 3.2 Mt in 2005/06 up to 5.5 Mt in 2012/13.in the high scenario (see table 3.20). In the low scenario a throughput of 1,0 Mt less is foreseen. The average parcel size is around 25-30,000 tons currently, with vessel sizes of around 30-35,000 DWT. Improved facilities are likely to increase the average parcel size, as and when the Inner Harbour is capable of handling 12.5 m draft from 2007/8 onwards.

Table 3-20 The demand for Fertilizers and Fertilisers Raw Materials (in Mt)

Main users	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
CFL	1.3	1.4	1.6	1.7	1.8	2.0	2.1	2.2
Others	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3
Total	3.2	3.5	3.9	4.2	4.5	4.9	5.2	5.5
Ship calls	126	130	110	120	112	122	130	138

In the long term the demand for handling fertilizers will benefit form the expected growth in agriculture and the increasing demand per hectare. For the period up to 2025/26 an potential throughput of about 9.0 to 10 Mt is foreseen. Competition will come from the ports Gangavaram and Kakinada.

3.3.4 Other dry bulks

This includes alumina powder, Coke (Met Coke, Pet coke, Lam coke), limestone and Food grains

Alumina

Exports of Nalco through Dhamanjuda plant expected to double in the coming 3 years due to the ongoing expansion of their calcined refinery. Imports of BALCO during current year expected to be around 0.25 to 0.3 Mt with a parcel size of 25,000 tons. The imports may increase to 0.4 Mt from the next year. Utkal Alumina is also expected to commence exports by 2009-10 with an initial throughput of 0.8 Mt increasing to 1.0 by 2012-13. Others such as Jindal and Vedanta alumina are expected to commence their production capacity in five years time, i.e., by 2010-11 with similar capacities as Utkal. BHP Minerals have indicated commencement by 2012-13 only. Exports of Alumina through Visakhapatnam are, compared to the other ports, cheaper due to the shorter distance.

Each of these plants will be required to raise their production / exports to about 3.0 Mt per annum for the projects to be viable. This means the likely traffic by 2016-17 from the five plants would be around 15 Mt. Once these mining leases and plants become operational there will be other players too who will add to the alumina exports traffic in the longer run.

Alumina is exported mainly to China. Vessels of around 40,000 DWT are being used on the trade, with average parcel sizes of 30,000 tons. No significant change in this pattern is expected.

Table 3-21 Exports of Alumina

Alumina	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
BALCO		0.3	0.4	0.4	0.4	0.4	0.4	0.4
NALCO	0.9	0.9	0.9	0.9	1.3	1.3	1.3	2.3
BHP								0.8
Utkal					0.8	0.8	0.9	1.0
Others						1.6	1.6	2.0
Total	0.9	1.2	1.3	1.3	2.5	4.1	4.2	6.5
Ship calls	29	40	43	43	83	137	140	217

The high forecast for the handling of alumina, as presented in Table 3-22, shows that the export of alumina will grow substantially during the coming plan period. This is mainly caused by the new initiatives such as BHP, Utkal and other traders. In the low scenario it is assumed that these flows will come later on stream and could result in about 1.5 to 2.0 Mt less throughput.

Limestone
Limestone is almost exclusively imported by RINL and it is to be expected that about 0.7 Mt could be imported by RNIL. With the opening of Gangavaram this cargo flow will practically be lost for VPT. After 2010/11 some limestone might be expected if new steel plants will be erected in the hinterland.

Table 3-22 The import of Limestone

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Limestone	0.5	0.5	0.5	0.3	0.1	0.2	0.3	0.3
Average parcel size (Kton)	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Ship calls	17	17	17	10	3	7	10	10

3.3.5 Liquid products: crude, POL

Oil and Gas

The estimated crude oil reserves in India are about 768 Mt from 123 oil fields and 31 oil & gas fields as of March 2005. This represents 0.48% of global reserves. Total production of crude oil was 32.19 Mt in 2005, and another 98.5 Mt was imported to meet demand. Available refining capacity will rise to around 228 Mt per year in the next decade. Industry estimates indicate that domestic production will remain about 35 Mt and imports will rise to 185-190 Mt, continuing India's dependence of crude oil imports. Consumption of petroleum products is likely to rise from 112 Mt in 2005-06 to about 135 Mt (net crude oil imports 110 Mt) by the end of the 11th Plan.

Gas consumption is forecasted to rise to about 55 MTOE with imports reaching 20 MTOE (leaving aside the recent finds in the KG basin). This assumes that Naphtha based fertiliser production switches completely to gas by the end of the 11th Plan. No pipelines are likely to become available for this level of gas import during the 11th Plan, so LNG imports would need to rise to four times from the current level of 5 Mt.

HPCL in Visakhapatnam

The public sector units dominate the midstream activity of refining, accounting for about 75% of total refining capacity of 132.46 Mt per annum from 18 refineries spread across the country. Indian Oil Corporation Limited (IOCL) is the major player in this field accounting for 41% of refining capacity followed by Bharat Petroleum Corporation Limited (BPCL) with 17%, Hindustan Petroleum Corporation Limited (HPCL) with 10% and ONGC around 7%. The remaining capacity of 25% is in the private sector. HPCL has two refineries, one at Mumbai and the other at Visakhapatnam.

HPCL refinery at Visakhapatnam was commissioned in 1957 as Caltex Oil Refining India Limited (CORIL). It was the First Oil refinery on the East Coast and the first major industry in the city of Visakhapatnam, Andhra Pradesh. The installed capacity of the refinery was 1.5 Mt per annum (1957). CORIL was taken over by Government of India and merged with Hindustan Petroleum Corporation Limited [HPCL] in 1978. The Refinery has expanded in phased manner over the years to meet the growing demand of petroleum products in the country and the current capacity is 7.5 Mt per annum (152,000 b/day].

HPCL is Fuels Based Refinery generating major products such as petrol, diesel and kerosene. Hence, crude meeting General Purpose Characteristics can be processed with the existing refinery configuration. Visakhapatnam Refinery has the possibility to process wide range of crude oil ranging from very high sulphur to low sulphur and non-bituminous category to Bituminous and Lubes based crude oil.

The existing capacity of the refinery will be increased to 8.33 Mt by 2006-07, and subsequently to 15 Mt by 2010-11. In order to meet this demand HPCL is looking forward to development of SBM facility by the port where HPCL can handle VLCC.

HPCL imports via Visakhapatnam about 7.5 MT per annum crude originating from Africa and the Middle East, West India and offshore near Andhra Pradesh. The export volume amounts to 2.3 Mt per annum and is destined mainly for Singapore and other Indian ports via coastal shipments. Moreover T/S cargo is handled on anchorage and NOM.

HPCL's investment plans

The investment plans of HPCL in Visakhapatnam consist of three projects:

1. The extension of the existing plant up to 8.33 Mt per annum by 2006/07
2. The extension on the medium term up to 15 Mt per annum by 2010/11.
3. The construction of a new plant in the long term: HPCL is planning to set up a new refinery in Visakhapatnam with a total investment of Rs. 180 billion. The new refinery will have a capacity of 15 Mt per annum and will be located about 30-35 km's from HPCL's existing refinery in Visakhapatnam.

In case the extension will be realised demand HPCL is looking forward to develop a SBM facility near the port where HPCL can handle VLCC in order to meet the future demand. This SBM will be under VPT authority.

The potential throughput for Visakhapatnam

The potential traffic for Visakhapatnam depends on the major expansion of the existing refinery, which is foreseen to be operational in 2009/10. Crude transhipments of about 4 to 5 Mt from large mother vessels to <48,000 DWT daughter vessels being carried out by IOCL currently at VPT for their Haldia refinery is likely to end once the Paradip - Haldia pipeline is commissioned and transfers streamlined. This is expected to happen in 2 years time at the latest (by 2009-10). Currently 2.3 Mt of products are exported which works out to 30% of the existing refining capacity, which is assumed to remain constant. The volume of import of LPG has been assumed to grow rapidly with the commissioning of the cavern in the port. The cavern is a joint venture project between HPCL and Total. This facility provides storage capacity of 60,000 Mt. On the basis of a storage turnover of 10 days, the additional throughput of LPG will be 2-2.5 Mt.

Table 3-23 The potential throughput of POL (in Mt)

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Import of Crude	7.5	8.3	9.0	9.0	10.0	12.0	13.5	16.0
Imports of Oil Products	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Imports of LPG	0.7	0.7	1.3	2.3	3.0	3.2	3.4	3.6
Export of Oil products	2.3	2.5	2.7	2.7	3.0	3.6	4.1	4.8
T/S of POL	5.2	2.5	1.5	1.5	1.0			
Total	16.6	15.0	15.6	16.7	18.3	20.2	22.5	26.0

The long term prospects for the handling of POL products will be limited by the capacity of the HPCL refinery, which implies a maximum import need of 16.0 Mt per annum. In the field of export some growth might be expected but will also depend on the handling capacity in the port and the SBM.

Further upside in liquids throughput is dependent on the decision to expand refinery capacity. On the downside, only two factors are of importance. In the shorter term, there can be delays in the construction of the facilities, so that the throughput of Crude could be delayed as well. Furthermore, sustained high oil prices may curtail demand in the medium to longer term. A low case throughput is estimated to be 9 Mt of Crude, and correspondingly lower exports of Product, at 2.7 Mt.

The ships calls are given corresponding with the traffic forecast are given below. It based on the assumption that crude will be shipped with an average vessel size of 80,000 DWT, as is current practice. As of the moment that the SBM will be operational 300,000 DWT tankers will call at the SBM. For the oil products current parcel size is 20,000 ton in 20 till 40,000 DWT product tankers. LPG vessels will have an average capacity of 15,000 DWT. At present the average parcel size is rather low. It is assumed that this increase in the future as very large gas carrier will be used.

Table 3-24 The ship calls 2005/06- 2012/13

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Import of Crude *	94	94	94	94	50	60	68	80
Imports of Oil Products	41	43	46	46	48	50	50	52
Imports of LPG	88	64	52	61	75	80	85	90
Export of Oil products	105	109	113	104	111	129	137	155
T/S of POL	75	36	22	22	14			
Total ship calls	402	346	326	327	298	319	340	376

*) for 2010/11 and onwards the ships calling at the SBM is set at 300,000 DWT

3.3.6 Other liquids chemicals, vegetable oil

The other liquids comprise a wider range of products, amounting to 0.7 Mt in 2005/06. Part of the products is used by the fertiliser industry, so that the growth expectations for that industry as formulated earlier is reflected in those inputs as well. Liquid Ammonia, Phosphoric Acid and Sulphuric Acid are the main commodities for this industry. Current throughput of these commodities is 0.3 Mt. Coromandel fertiliser is the largest customer. National Aluminium Company is the single client for Caustic Soda, importing 0.2 Mt. Alumina production is expected to increase; hence Caustic Soda is to increase as well. Remaining products are spread over many importers. Products include Acetone, Alcohol, Methanol and Styrene Monomer. Total imports are currently 0.13 Mt. These cargoes will grow with general economic activity. Projections taking into account the requirement of the above said users and other new users like Utkal, Jindal, Vedanta, BHP Minerals etc are furnished in Table 4.6 below.

Average parcel sizes are typically small, around 5,000 tons. Vessel size is around 20,000 DWT. Part cargoes are thus a reality and it is assumed that over time, the size increases by 10% per year.

Table 3-25 The potential for other liquids

	2005/06	20060/7	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
CFL (all chemicals)		0.5	0.5	0.5	0.65	0.65	0.65	0.8
Caustic soda (Nalco)		0.25	0.25	0.25	0.35	0.35	0.35	0.5
Caustic soda (others)					0.2	0.6	0.6	0.8
Other liquids		0.05	0.15	0.25	0.1	0.2	0.3	0.4
Throughput Mt	0.7	0.8	0.9	1.0	1.3	1.8	1.9	2.5
Average parcel size (Kton)	5,000	5,000	6,000	6,000	7,000	10,000	10,000	13,000
Calls	140	152	163	173	181	188	194	199

3.3.7 General cargo/break bulk cargo

The remaining break-bulk consists of illeminite sand (0.2 Mt), granulated furnace Slags (0.75 Mt), Food grains (wheat etc) (0.5 Mt), steel & iron (0.6 Mt) and other smaller quantities of products such as timber and project cargo. The average parcel size is just below 10,000 ton currently.

Table 3-26 The handling of conventional general cargo (in Mt)

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Steel products/pig iron	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0
Granulated slag	0.75	0.9	1.0	1.1	1.3	1.5	1.7	2.0
Food grains	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.3
Other cargo	1	1.1	1.2	1.3	1.5	1.6	1.8	1.9
Total	3.05	3.2	3.6	4.0	4.4	5.0	5.6	6.2
Average parcel size (Kton)	9,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Ship calls	314	328	366	409	457	512	574	643

3.3.8 Containers

Container traffic in India and also in the hinterland of Visakhapatnam is still nascent. It is obvious that the degree of containerisation will substantially increase in the coming decades. Containerised cargo consists of imported consumables and some exports. The major stimulator for containers will be the export, which will occur when India is going to export consumer goods/intermediate products on a large scale (see e.g. the development of the economies in the Far East). Also export to Delhi and Hyderabad, which is currently being handled by Mumbai could create beneficial import flows to Visakhapatnam. This is due to both the total cost of the logistics chain, as well as the congestion currently present in Mumbai. The total sailing time will be reduced by two days at sea, and as the landside infrastructure is up-to-date and able to handle the increased traffic, it is likely that this route will be increasingly used.

Container traffic in Visakhapatnam reached a level of 47,000 TEU in 2005/06 from 45,000 TEU in 2004/05. However, the traffic in 2004-05 was over twice the 20,000 TEU traffic in 2003-04.This was caused by new container flows from Orissa and Andhra Pradesh. It is to be expected that the container traffic will grow substantially in the coming decades. There are already four container freight stations established and CONCOR has also established Port container Depot to handle block trains. Visakha Container Terminal is adapting new marketing strategies to attract cargo from the direct hinterland, which is presently routed via Chennai & JNPT.

As discussed in the previous chapter, cargo flows in containers from proposed SEZs at Visakhapatnam, Nagpur, Ranchi, as well as the anticipated increase in textile exports from Andhra Pradesh flowing from the AP Govt’s Textile and Apparel Promotion Policy.

At present the average call size is about 200 TEU. It is assumed that this will increase annually by 20%, resulting in an average call size of 700 TEU by 2012/13. However, growing levels of containerization particularly those in the southern districts of Andhra Pradesh such as Krishna, Guntur, Praksam and even Hyderabad will actually push cargoes to container ports such as Chennai for factors such as proximity, convenience and frequency of ship sailings from Chennai and not bulk ports such as Visakhapatnam. As for transshipment traffic through Colombo being carried instead on mother vessels from Indian ports, the location of Visakhapatnam is not ideal for the same. Hence Consultants are constrained to retain their modest forecasts for container traffic through Visakhapatnam.

Table 3-27 Container traffic

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Million Tonnes	0.6	0.8	1.3	1.9	2.4	2.9	3.5	4.0
TEUs *1000	40	67	111	156	200	244	289	333
Average parcel size (Kton)	200	200	300	400	400	500	600	700
Ship calls	195	271	376	439	470	479	472	454
Total	54.8	56.1	59.2	62.8	67.2	72.8	78.0	89.7

3.3.9 Long term forecast for VPT

The long term forecast for VPT is based on a combination of trend extrapolation and likely developments in specific commodity groups. The following assumptions and considerations underlay the forecast:

- Due to capacity constraints in the refineries, the group of petroleum, oil and other liquids is not going to limitations of the refineries. POL will therefore see a growth until 2013, before stabilizing on an output matching the refineries in the service area.
- Other liquids, which include raw materials for fertilizers and alumina plants, will see a high growth rate. This is due to the potentially high growth in the fertilizer sector.
- Due to the increased domestic demand for steel, the growth in export of iron ore will decrease. Thermal coal projections are not based on trends as it is dependent on TNEB requirement alone. With the Kudangulam Mega Nuclear Power Plant coming up and the Kalpakkam Plant being expanded, thermal power as a proportion of total power is expected to decline in TN and hence traffic is estimated based on the assumption that coal will continue to be an important fuel for power generation but traffic growth will be marginally incremental.
- Coking and steam coal imports will also continue to increase at the same pace in the light of domestic steel industry growth.
- In the case of Fertilizers, the current growth trend is likely to continue on the back of the emphasis being given by GoI to agriculture growth flattening out of fertilizers demand as has happened in the developed world is not expected to occur in India within the period the projections are made.
- Other dry bulks include alumina, cokes and limestone. With the likelihood of several of the alumina mining projects coming through in Orissa and the mines being predominantly being in southern Orissa, VPT will attract the cargoes for these plants. However, the growth beyond 2017 may not be as significant as between 2013 and 2017 when the mining leases and plants reach optimum levels.
- General cargo / break bulk growth will be limited by the growing trend in containerization of general cargo.
- Container traffic is bound to grow at a rapid pace on account of the vibrant economic growth that will trigger a higher growth in manufacturing sector than at present.

Table 3-28 Long term forecast, Mt

Commodities	2006	2013	2017	2026
POL	16.9	23.9	24.9	26.5
Other Liquids	0.7	2.3	2.8	3.6
Iron ore	16.0	23.0	25.5	29.5
Thermal Coal	2.7	3.0	3.0	3.0
Coking Coal	7.1	6.5	9.5	14.9
Steam Coal	2.0	1.3	1.6	2.0
Fertilizer & FRM	3.2	5.5	6.7	9.2
Other dry bulks	5.6	15.6	22.1	34.0
General cargo / Break bulk	1.0	1.9	2.6	3.8
Containers	0.6	4.0	6.4	13.8
Total	55.8	87.1	105.2	140.3

The potential for the port is estimated at around 186 Mt by 2025/26. However, this potential cannot be realised without further investment in the port. The main growth areas are in other dry bulks and fertilizer. Substantial spare capacity remains with ample scope for mechanisation and accommodating a significant part of this anticipated growth.

3.4 Summary

Visakhapatnam Port ranks 1st among the 12 major ports in terms of throughput volumes; a position it has been holding consistently over the last several years. The Ministry of Transport has set targets for Visakhapatnam for the year 2013-14, which indicated that Visakhapatnam port should grow by another 80%, or approximately 8% annually. Most of that growth has to come from POL related traffic, as well as Thermal coal. The growth in the previous ten years was an average of around 4.5% per year. As such, the target implies almost a doubling of the growth rates.

The ability to realise such increase depends on several factors. First of all, various large companies (end-users of the port) have substantial expansion plans. Although the realisation of these plans largely depends on foreseen economic development and location decisions of the associated industries, its impact on trade and traffic in Visakhapatnam is evident and should be accounted for. Secondly, the introduction of larger vessels such as Cape-size vessels requires additional investments in port facilities. The timing of such investments has a major impact on the attractiveness of the port and thus on its market share. Thirdly, but closely related with the second factor, are the development plans of other, competing ports. For example, if Gangavaram will be able to provide facilities for 200,000 DWT vessels from 2008-09 onwards, a potential loss of trade – more specifically: iron ore – is likely. The condition that Visakhapatnam is the first port that invests is therefore a major assumption in the trade and traffic forecast.

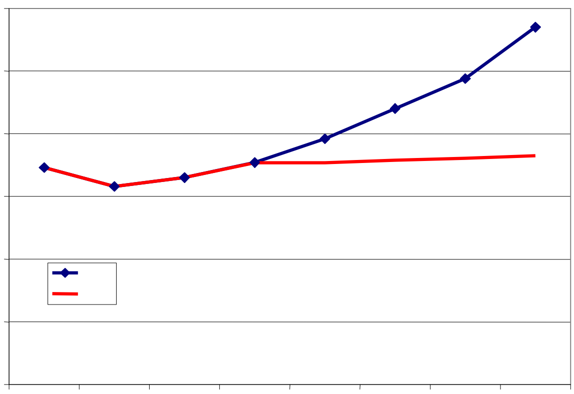
From an analysis of the current seaside origins and destinations appeared a rapid growth of iron ore exports to China, which has risen in 2004-05 before falling back in 2005-06. Considering the very strong economic growth of China, a further growth of this trade is however likely. Furthermore, there has been a marked shift in coastwise exports to the West of India, particularly to Hazira and Mumbai. It appeared from the market analysis that the West of India shows also a prosperous economic development, which supports the likeliness of trade growth.

The table below summarizes the cargo forecast for VPT. It appears that in the base-case cargo grows from 55 Mt in 2005-06 to over 80 Mt in 2012-13. One-third of this increase originates from a single project, namely the expansion of the refinery. Much depends also on the expansion of the steel, mining and POL industries. The downside risk of the forecast is estimated to be around 15 Mt while an upside is then expected to be very small indeed, if existent, as the new port of Gangavaram will open by 2008-09. The base-case numbers are presented in the table below.

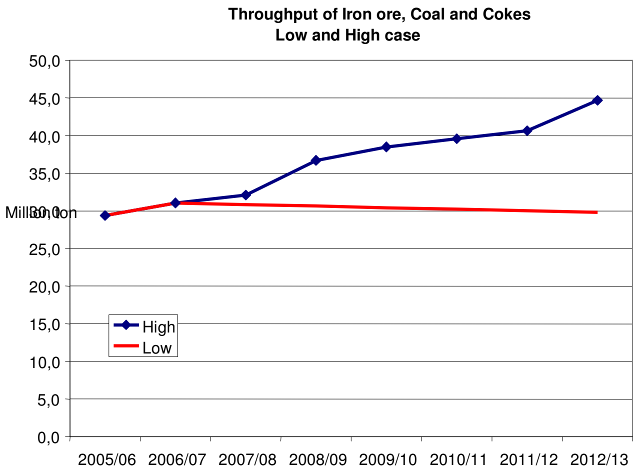
Table 3-29 Summary of cargo forecast for VPT, 2005/06-2012/13 (in Mt)

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
POL	16.6	15.0	15.6	16.7	18.3	20.2	22.5	26.0
Other liquids	0.7	0.8	0.9	1.0	1.3	1.8	1.9	2.5
Iron Ore	16.0	17.5	17.5	19.0	20.0	20.0	20.0	23.0
Thermal coal	2.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Coking coal imports	7.1	7.3	7.5	7.0	6.2	5.7	6.0	6.5
Steam coal	2.0	1.5	2.2	2.3	1.9	2.0	2.2	2.3
Fertilizer & FRM	3.2	3.5	3.9	4.2	4.5	4.9	5.2	5.5
Other dry bulks	3.1	3.5	3.7	3.8	5.1	7.4	8.1	10.7
General Cargo / Break Bulk	2.9	3.2	3.6	3.9	4.5	4.9	5.6	6.2
Containers	0.6	0.8	1.3	1.9	2.4	2.9	3.5	4.0
Total	54.8	56.1	59.2	62.8	67.2	72.8	78.0	89.7

There has also been developed a high and low scenario for each main commodity group, which is explained further below.



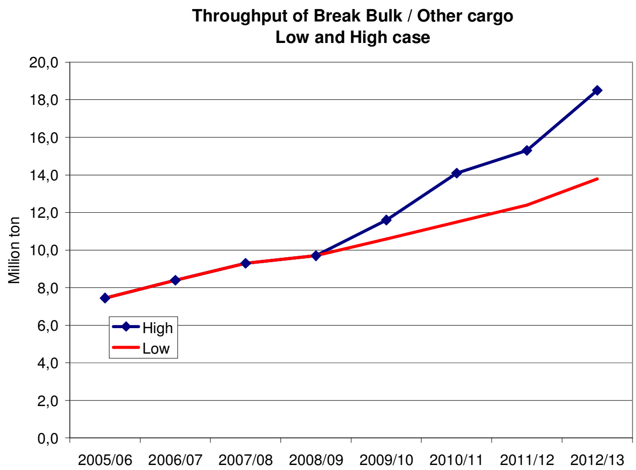
The volume of import of LPG has been assumed to grow rapidly with the commissioning of the cavern in the port. Further upside in liquids throughput is dependent on the decision to expand refinery capacity.
On the downside, there can be delays in the construction of the facilities, delaying the throughput of Crude, or sustained high oil prices that may curtail demand in the medium to longer term. A low case throughput is estimated to be 9 Mt of Crude, and correspondingly lower exports of Product, at 2.7 Mt.



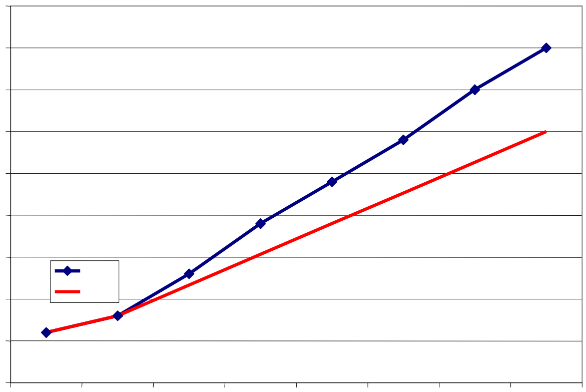
In the long term, the prospects for the handling of coking coal depends on the development in the iron and steel sector in the catchment area of the port. Based on trend extrapolation the future demand in the year 2025/25 could range from 15,0 to 20,0 Mt.

The forecast for thermal coal ranges from 3,0 Mt in the high scenario to nil in case the cargo flow will be re-routed via Paradip.

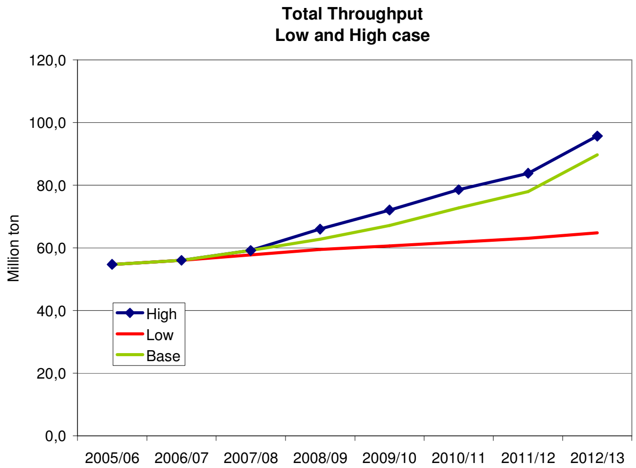
For the planning period, the high forecast for the imports of steam coal amounts to a throughput level of 3.3 Mt. Due to the new investment in Gangavaram a loss of cargo of about 1,0 Mt could occur. This implies that the future throughput will range from 2.3 Mt to 3.3 Mt for the year 2012/13. At the end an additional 3.0 Mt could be imported in case the power plant for HPCL will be constructed.



General cargo / break bulk growth will be limited by the growing trend in containerization of general cargo.



Growing levels of containerization particularly those in the southern districts of Andhra Pradesh will push cargoes to container ports such as Chennai for factors such as proximity, convenience and frequency of ship sailings from Chennai. As for transshipment traffic through Colombo being carried instead on mother vessels from Indian ports, the location of Visakhapatnam is not ideal for the same. Hence Consultants are constrained to retain their modest forecasts for container traffic through Visakhapatnam.



The variations between the low case and the high case in 2012/13 is 30.9 MT. Two main explanations exist for this difference. The first is the development of liquids, with the possible large growth in LPG, as well as expansion of refinery capacity, which would both have a very positive impact on the port throughput of POL products. The second reason, is the development of dry bulk, especially iron ore where export limitations may apply. For the financial implications, the green line, the base case will be used.

The translation of the above-presented cargo forecast throughput into vessel calls is summarised in the next table. The immediate future shows only moderate increases in throughput, which are compensated in part by increased parcel sizes. This is possible as the Inner Harbour will allow deeper draft vessels from 2007 onwards. Most of the increase is expected to arise from General Cargo and Break Bulk vessels. In total, the number of vessels is expected to rise by 20-25% over the plan horizon, to reach nearly 2600 by 2012-13.

Table 3-30 Summary of ship calls forecast for VPT, 2005/06-2012/13 (in vessels)

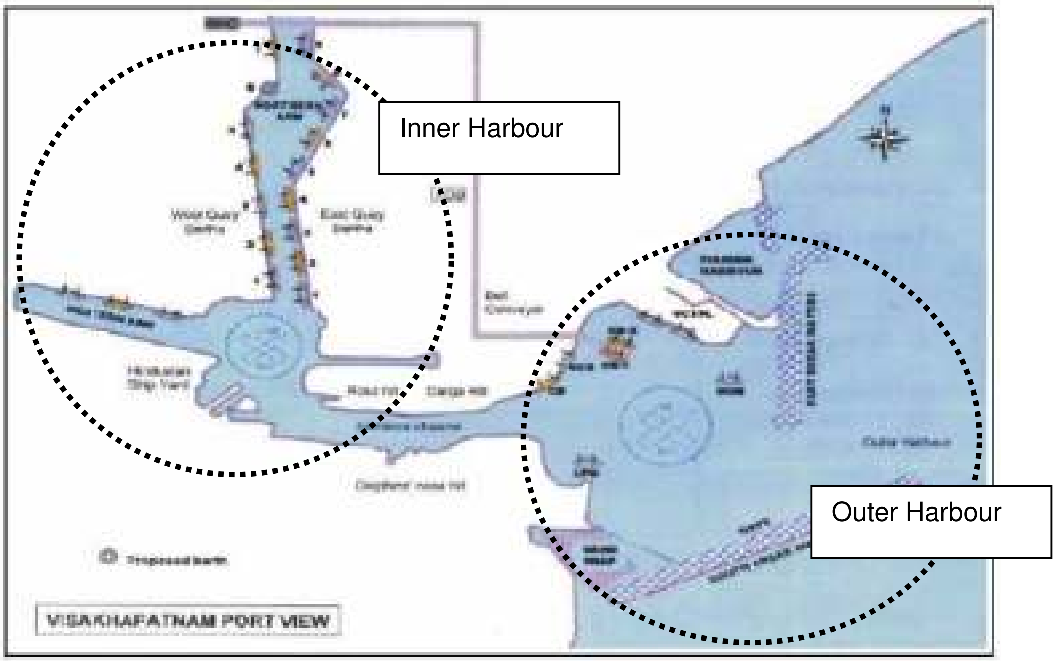
Vessel calls by type	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
POL	507	415	405	416	455	351	378	421
Other liquids	140	145	149	150	178	199	215	236
Iron Ore	308	318	292	282	298	298	298	348
Thermal coal	82	91	67	67	67	67	67	67
Coking coal imports	205	203	167	156	124	114	120	130
Steam coal	67	47	61	58	48	50	55	58
Fertilizer & FRM	126	130	110	120	112	122	130	138
Other dry bulks	100	114	122	123	170	248	268	357
General Cargo / Break Bulk	314	328	366	409	457	512	574	643
Containers	195	271	376	439	470	479	472	454
Total	2,044	2,062	2,114	2,220	2,380	2,439	2,576	2,851

4. CONFRONTATION OF DEMAND AND SUPPLY

4.1 Port layout

The port located on the East Coast of India includes 2 harbours viz. the Outer Harbour with 7 berths and the Inner Harbour with 19 berths.

Map 4-1 The Port Lay-out



The Inner Harbour consists of two arms in use by the V.P.T, the northern arm and the western arm. The northern arm is used for predominately coal, fertilizers, food grains, fertilizer raw materials, illuminate sand and general cargo such as steel products. The western arm is used for Fertilizer Raw materials, Food grains, sand, petroleum products (POL), Ammonia, Liquid Sulphur and other bulk/break bulk cargo. Both arms have limited draft of -10.21m on 1.06 m tide, which is sufficient for ships up to 45,000 DWT.

The north part of the northern arm is presently not foreseen of quay walls and provides possibilities to expand this part of the port. Some rough ideas have been developed by the VPT. A feasibility study for berth WQ6 has been executed in 1999.

The access channel to the inner Harbour is relatively narrow. At the smallest section the channel is only 97.5 m wide with a rocky coastline. Due to the dimensions of the channel navigational restrictions apply. Only one-way traffic is possible and at night the allowable ship size is further reduced. Dredging works for widening and deepening the Inner channel and Inner Harbour Turning Basin are in progress. The details of the navigational restrictions and Navaids as given in Annex 2.5.

The outer harbour is bordered by the two breakwaters and the inner port access channel. The products which are handled here are coal, iron ore, containers, crude LPG and other POL. The draft in the outer basin is maximum 17 m on 0.5 m tide with various water depths along the berths.

Bottlenecks in the outer port are the limitation of space between the two breakwaters. At the moment, crude ships already experience navigational restrictions. Berthing is restricted to day light only for arrivals greater than 114,000 DWT, vessels upto 114,000 DWT are handled at night with two pilots to OSTT.

4.2 Port capacity

The loading and discharge rates to and from vessels in both the inner and outer harbour have been analysed using the data as received by the VPT (administration reports 2004-2005, and the port view 2005-2006 which was handed over on 30-10-06).

The rates in these data were defined as average output per ship per berth day. It is calculated as the total amount of loaded / discharged cargo divided by the total amount of time the vessel is at the berth. This implies that actual rates are higher since berthing and deberthing time is included. The table hereafter shows the rates for the grouped cargo divided into export and import for the years 2004-2005 and 2005-2006.

Table 4-1 The throughput of the Port, export commodities, 2004-2006

	Export cargo	Cargo handled MT		Av. Ship size ('000 DWT)		Av. Output per ship berth day ('000 tons)	
		2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
1	I. Ore (Mech)	11.42	10.99	67.12	68.97	45.92	39.63
2.	I. Pellets (Mech)	2.82	2.71	77.14	93.64	49.77	43.56
3.	Steel cargo	0.24	0.44	17.08	11.70	1.90	1.74
4.	Pig iron	0.08	0.13	30.86	38.27	8.00	5.94
5.	Thermal coal	2.49	2.70	46.55	45.68	10.62	9.75
6.	Alumina	0.91	0.86	37.55	38.03	20.43	19.81
7.	POL (IH)	1.75	2.31	33.24	34.42	10.02	10.29
8.	I. ore (Conv.)	2.00	1.96	38.76	42.58	9.24	8.78
9.	Pellets (Conv)	0.28	0.31	39.10	30.31	9.21	8.81
10.	Foodgrains (Bulk)	0.36	0.43	22.66	--	3.34	--

Note: *[A] Data 2004-2005 from admin report 2004-2005; *[B] Data 2005-2006 from Port View document 2005-2006

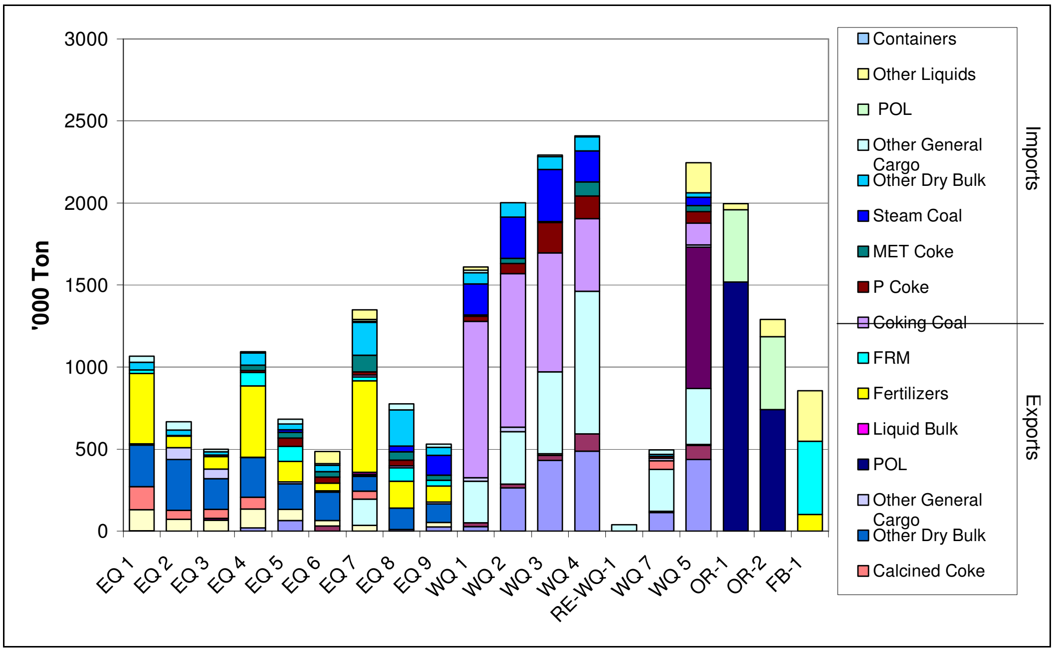
Table 4-2 The throughput of the Port, import commodities, 2004-2006

	Import cargo	Cargo handled MT		Av. Ship size '000 DWT		Av. Output per ship berth day ('000 tons)	
		2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
1	Fertilizers QB	1.24	2.19	32.36	36.62	4.53	4.46
2.	Fertilizers FB	0.12	0.11	35.93	36.88	2.73	3.23
3.	Sulphur FB	0.01	0.03	16.13	23.85	4.04	2.17
4.	Rock phosphate FB	0.35	0.44	32.93	36.67	5.08	5.48
5.	Sulphur QB	0.11	0.14	22.30	22.79	4.60	3.59
6.	Rock Phosphate QB	0.23	0.28	23.47	30.99	5.39	4.08
7.	Coking Coal & Steam coal	6.87	8.95	54.58	54.98	11.63	10.29
8.	Imp. crude oil	7.90	7.53	115.09	97.08	67.55	58.58
9.	Imp. POL OH	0.62	1.10	39.43	37.47	16.15	15.12
10.	Imp. POL IH	0.46	0.88	19.63	28.68	6.10	6.84
11.	LPG	0.11	0.32	12.05	14.79	3.46	4.11
12.	Other liquids	0.70	0.79	52.30	51.70	20.14	19.90
13.	Containers* (No. of TEUs(	0.63 (45549)	0.63 (46747)	17.38	17.80	9.67	8.10

Note: *[A] Data 2004-2005 from admin report 2004-2005; *[B] Data 2005-2006 from Port View document 2005-2006

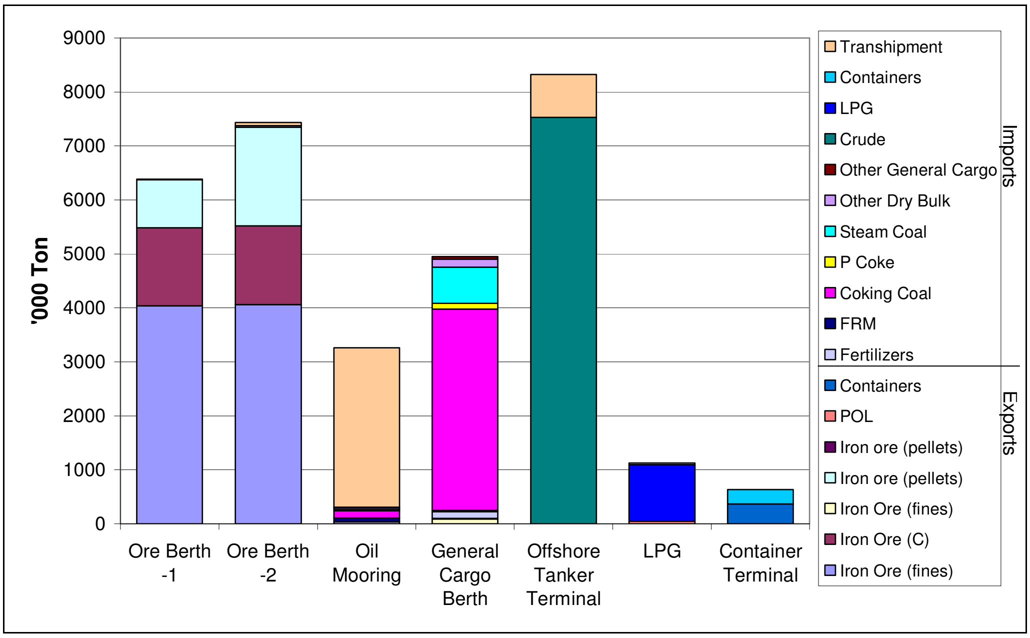
60% of the cargoes are handled in the Outer Harbour, while 40% is handled in the Inner Harbour. A small share is handled at the Anchorage. Throughput in the Inner Harbour is focused on the West Quays 1-4, handling a third of all IH cargo or 8.3 Mt, while the nine East Quay berths handle 7.1 Mt. WQ 5-7 handles 2.7 Mt, the captive FB handles around 0.9 Mt and the OR-berths handle 3.3 Mt. The chart shows the breakdown by quay and commodity and direction.

Figure 4-1 Inner Harbour cargo throughput 2005-06, '000 ton



Throughput in the Outer Harbour focuses on the Ore Berths, handling 40% of all cargo. The OSTT handles over 8 Mt, or just over a quarter of all throughputs. Transhipment takes place both on the OSTT and the Oil Mooring. The General Cargo Berth handles 5 Mt.

Figure 4-2 Outer Harbour cargo throughput 2005-06, '000 ton



The following commodities are handled with mechanized installations in the port:

- Iron ore
- Alumina
- POL
- Crude
- Liquids
- Containers

All other cargos are handled by ships gear or mobile cranes and are all cargoes are transported from and to the quays by trucks.

The loading rates for iron ore seem low comparing to the actual design capacity of the installation. The main reasons given by VPT are the life time of the installation; most parts are more than 30 years old and as such various components need urgent replacement. The ship loader was originally designed for the handling of lumps, at present fines are handled. The stack yard has constrains due to he fact it stores cargo for more than 20 different clients which cause inefficiencies when reclaiming the ore.

Alumina is handled by a private operator with a ship loader of 1,500 tph. The loading rates are within the range with respect to the loading equipment.

POL is handled at various locations and consists of many different products, all with their own loading and discharge rates. The berth output is about 10,000 ton per day which is including the berthing and deberthing time. This is within the normal benchmarks according to other ports.

Crude is unloaded with a berth day output of 60,000 ton day, which is within the normal benchmarks according to other ports. A note can be made on the fact that the average unloading in 2004-2005 was much higher.

Containers are handled by STS cranes at the container terminal. Rates are not very important since very few containers are presently handled. Normal output of such STS cranes is in the order of 20 moves per hour per crane.

As stated before all other cargo is handled manually and loading and discharge rates are accordingly very low. For example, coking coal is discharged with an output per berth day of 10,000 ton. In case this operation is mechanized the rate should be about 30,000 ton per berth per day. The same goes for other bulk commodities, such as fertilizers and other coals.

4.3 Berth occupancies / ships TRT

4.3.1 General

The berth occupancies have been calculated by the consultants, using the data as indicated in the previous section. For the calculations the total amount of available berth days per year of 330 has been applied. Included in the total berth time is the sailing time from and to the anchorage, which is calculated from the administration reports data since it was not explicitly mentioned.

4.3.2 Berth Occupancy in 2005-2006

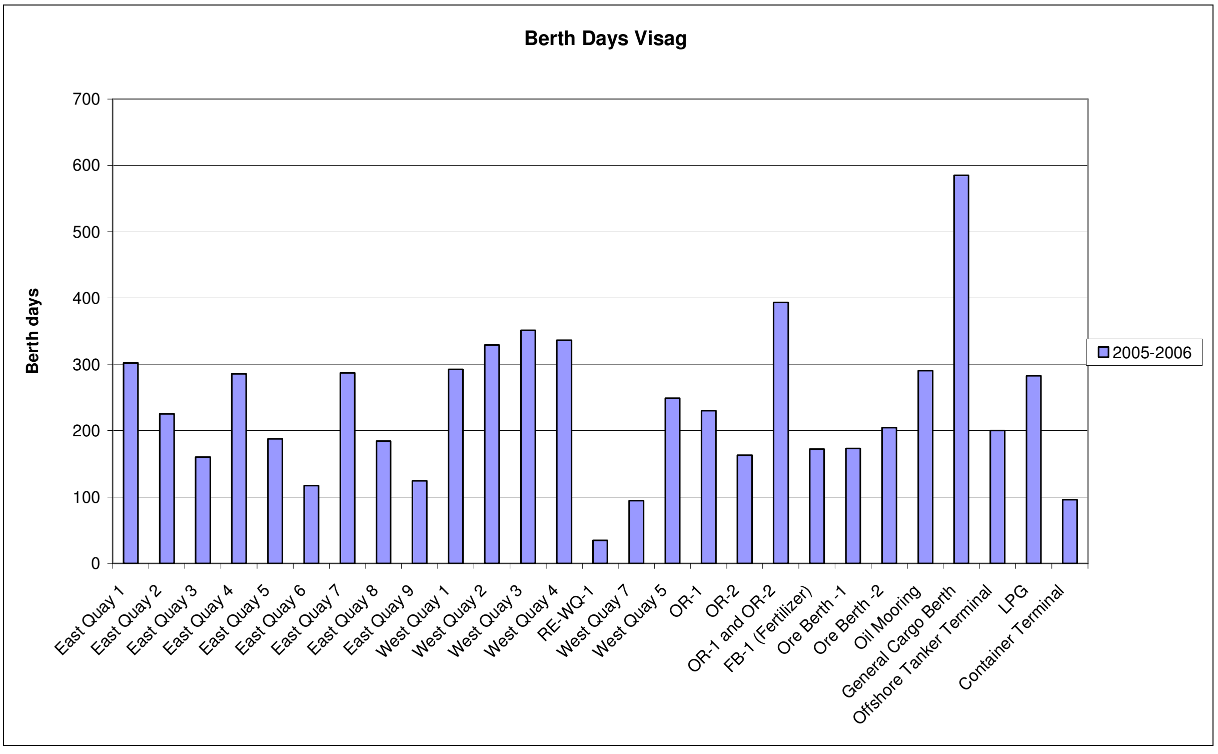
The total berth occupancy for the inner harbour was 68% while the occupancy for the outer harbour excluding the container terminal was 76%. The berth occupancies per berth groups are the following:

Table 4-3 Berth Occupancy, 2005-2006, by Harbour and berth group, %

Inner Harbour		Outer Harbour	
East Quay 1 through 9	67%	OB-1 / OB-2	57%
West Quays 1 through 7	75%	Oil Mooring	88%
OR-1 / OR-2	60%	General Cargo Berth	104%
FB-1	52%	OSTT	86%
		LPG	

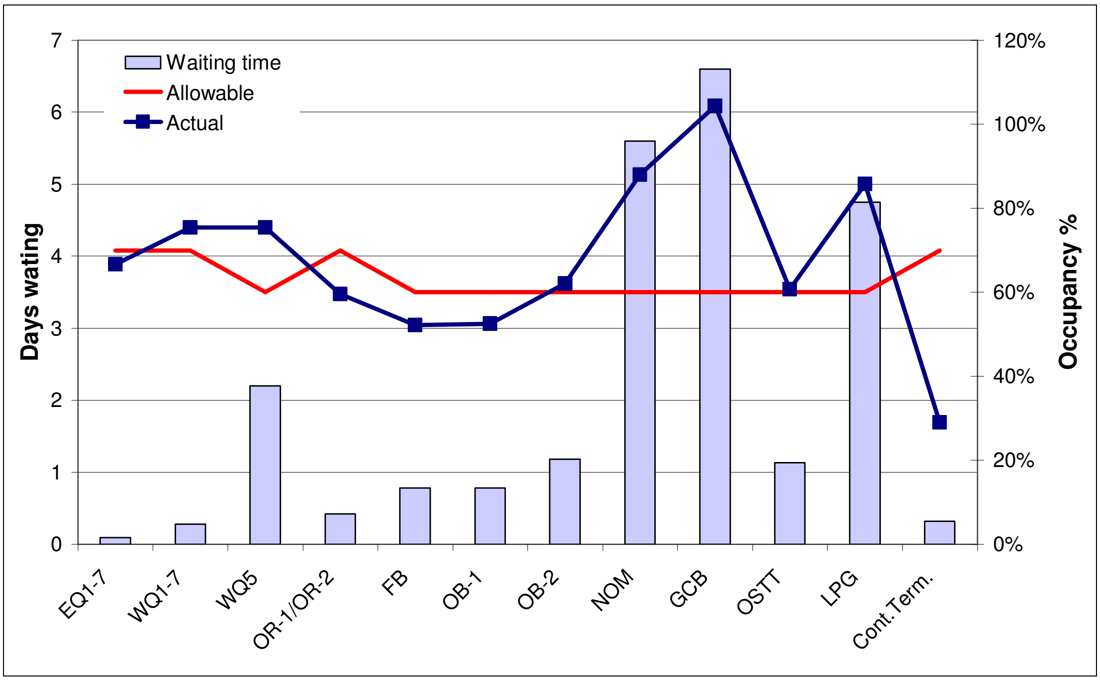
The figure below gives the berthing days by handling facility at VPT. The data from the Administration Report of VPT have been used to calibrate berthing days

Figure 4-3 Berthing days by quay, 2005-06



The following chart gives the allowable occupancy as per the guidelines versus the actually observed occupancy and the implied waiting time in days. It is clear that the utilisation has risen to such levels at a number of berths, that waiting times have now increased to more than 6 days.

Figure 4-4 Occupancy and implied waiting time, 2005-06



4.3.3 Cargo handling capacity

The present cargo handling capacity is determined with the rates of 2005-2006 and the maximum acceptable berth occupancies as determined by the government. These are given in the table below.

Table 4-4 Acceptable Berth Occupancy (in %)

	Acceptable utilisation
Specialised berths:	
One berth	60%
More than one berth	70%
For interchangeable berths	
Up to 3 berths	70%
More than 3 berths	75%

The available number of days is determined as 330 per year.

It can be concluded from previous section that the port has reached its maximum capacity in case the situation will remain as it is. The liquids berths have exceeded the maximum allowable occupancy resulting in additional waiting times for the vessels. The General Cargo Berth is heavily overused. A percentage of 104% means that the facility is occupied for more than 330 days.

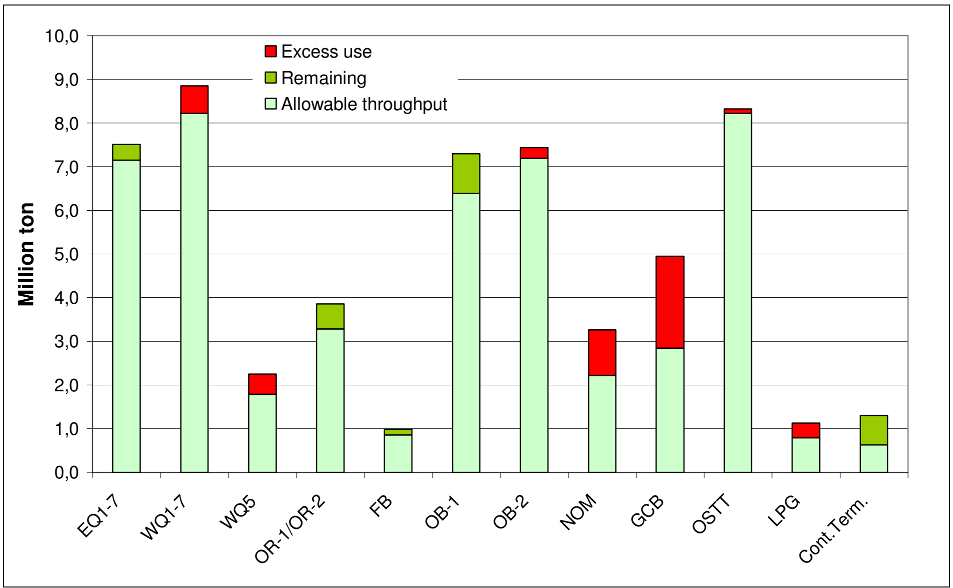
The inner port has however space for more cargo while the outer port is handling almost the maximum allowable. In case the allowable berth occupancies are used as indicated here before, the amount of cargo which can be handled is about 58 million ton per year which is 5 % more than was handled in

2005-2006. It should be noted that is only due to the remaining space at the inner port and additional room at the iron-ore berth.

The liquid berths in the outer harbour handled in 2005-2006 about 12.7 million ton of cargo. The maximum allowable capacity is 12.3 million ton. The General Cargo Berth handled in 2005-2006 about 5 million ton of cargo while the maximum allowable throughput is only 3 million ton.

The chart below summarises the remaining capacity, or the "excess" use with its implications on waiting time as indicated in the previous section.

Figure 4-5 Capacity use by berth group, 2005-06



4.3.4 Ships TRT

The total round time for ships is defined as the moment the ship arrives at the anchorage, sailing to the berth, berth time, sailing to the anchorage till the moment it leaves the anchorage. The waiting time at the anchorage is given in the reports by the VPT as an average value for different commodity groups. The average TRT for the export cargo is 3.9 days, while the TRT for the import cargo is 4.4 days. The average TRT for cargo groups by the VPT were only available for the years 2004-2005 are:

Table 4-5 Average Turn-around-Time 2004-05 (in days)

Cargo group	TRT in days
Containers	0.43
Break Bulk	4.48
Dry bulk mechanized	3.07
Dry bulk conventional	4.54
Liquid bulk	2.09

4.4 Port Operations

Factors which are effecting further improvement in productivity

1. Entrance channel to the Inner Harbour is a narrow channel with lot of bends and curves. The maximum vessel size that can be handled at Inner Harbour is 45,000 DWT and 10.06 m. draft. Because of the limitation of the Inner Harbour to handle Panamax vessels which are deployed for Coking coal and Fertilisers the only deep draft berth is General Cargo berth which is being utilized for accommodating deeper draft ships putting lot of pressure on this berth and avoidable pre-berthing detention to vessels at anchorage. This limitation is being addressed by the Port by deepening Inner Harbour entrance channel and turning circle in phases of which phase-I is nearing completion.
2. There is scope for further improvement in productivity if the following issues are addressed.
   a) Inadequate bagging facility for foodgrain and fertilizers restricting ship shore discharge rate.
   b) Inadequate stacking space close to the operational area resulting in long lead for cargoes handled at Inner harbour.
   c) Allotment of stacking space can be done on a move rational basis with less lead time.
   d) There are no handling equipment on the western side of the Northern arm. Vessels accommodated at these berths are handling cargo with ship gear. In the event of arrival of ships with lower capacity ship gear / inadequate ship gear, obsolete gear, productivity is adversely affected.
   e) About 65% of cargo is moved by Railways from and to the hinterland. Availability of adequate no.of railway wagons is a pre-requisite for faster evacuation of cargo. In the recent past it is observed that the supply of wagons by Railways is not commensurate with the ship shore discharge resulting in building up huge stacks which in turn is affecting productivity of vessels at berth.
   f) There is no night navigation facility for crude oil tankers of more than 115000 DWT. This is resulting in detention of tankers calling at the port.
   g) There is an urgent need to rationalize and modify the incentive schemes. Datums were laid down 10 years ago and are not really acting as an incentive to enhance productivity. The datums are so low that with higher capacity grabs, labour are able to achieve these norms during the middle of the shift itself resulting in low productivity for certain cargoes.
   h) Multiple handling of coking coal and other bulk cargoes is affecting further improvement in the productivity and also affecting quality of the product.

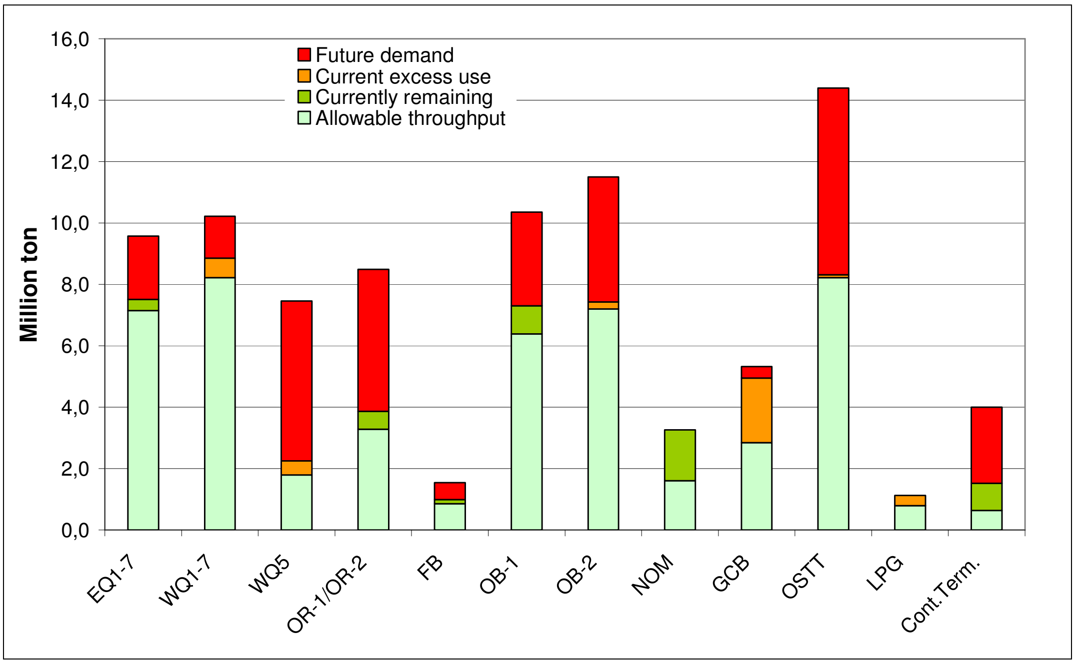
Some of the other factors which are effecting productivity at the berths are:
   i) Inadequate connectivity for the container terminal.
   ii) Inadequate no.of weigh bridges.
   iii) Inadequate lighting at stackyards.
   iv) Inadequate drainage system.
   v) Inadequate availability of trucks for movement of cargoes.
   vi) Inadequate facilities at Railway sidings.

The above mentioned factors which are effecting further improvement in productivity will be discussed in the various section herafter in the report. Solutions to improve the productivity are highlighted and discussed in Sections 4 and 5.

4.5 Confrontation of supply and demand

The confrontation of supply and demand of the port's capacity is given in Figure 4-6 and Table 4-6. Orange is indicating the shortfall of capacity that is already experienced at the moment. In Red the present capacity is compared with the future throughput levels according to the traffic forecast and current use of the facilities.

Figure 4-6 Capacity use by berth group, 2005-06 capacity versus 2012-13 demand



Note: NOM shows future remaining capacity, instead of current

It shows that there is already an overall shortfall taking into account the present remaining capacity of 2.7 Mt. Waiting times are rising for berths and suboptimal logistics are occurring, resulting in high costs for the port users. Accepting current waiting times on the berths with excessive use, would suggest that 57 Mt is possible for the port, excluding the transhipment on the anchorage.

Table 4-6 Current capacity versus current and future throughput, Mt (excl. transhipment at anchorage)

	Allowable throughput	Throughput 2005-06	Throughput 2012-13
EQ1-7	7.5	7.1	11.0
WQ1-7	8.2	8.8	10.2
WQ5	1.8	2.2	7.5
OR-1/OR-2	3.9	3.3	8.7
FB	1.0	0.9	1.5
OB-1	7.3	6.4	10.4
OB-2	7.2	7.4	11.5
NOM	2.2	3.3	1.6
GCB	2.8	4.9	5.3
OSTT	8.2	8.3	14.4
LPG	0.8	1.1	3.6
Container terminal	1.3	0.6	4.0
Total	52.2	54.3	89.7

Note: future demand is allocated on the basis of current berth use

The residual capacity is on a few berths:

- OB-1, which is expected to remain just below capacity for the next few years, until 2010. As such, some time remains to upgrade the facilities without incurring immediate and fast rising waiting times. However, the excess capacity is low indeed.
- OR-1 and OR-2, where some 0.6 Mt of capacity remains before waiting times start to increase. With demand expected to increase gradually, here too time remains to undertake remedial action, but by 2009 pressure will be mounting.
- The captive fertiliser berth will come under pressure once the new facilities at Coromandel Fertiliser come on-stream. This will be in the near future.
- The container terminal has sufficient capacity until 2009.

The other facilities are in immediate need of resolution.

The table indicates the throughput by berth in the current configuration and its capacities. The main point is that throughput is expected to increase gradually and remain fairly stable for the next few years before jumping significantly as new industrial capacity comes on stream. The berths with most capacity still available are also likely to see a drop in throughput. Hence, re-allocation of cargo will happen.

Table 4-7 Future Berth throughput with current capacity configuration (in Mt)

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
EQ1-7	7.1	7.8	8.2	8.5	8.7	9.3	10.2	11.0
WQ1-7	8.8	7.8	8.1	8.3	8.5	8.8	9.6	10.2
WQ5	2.2	1.9	2.0	2.0	3.2	4.9	5.1	7.5
OR-1/OR-2	3.3	4.2	4.6	4.8	5.5	6.6	7.3	8.7
FB	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.5
OB-1	6.4	7.9	7.9	8.6	9.0	9.0	9.0	10.4
OB-2	7.4	8.8	8.8	9.5	10.0	10.0	10.0	11.5
NOM	3.3	2.6	2.0	2.0	1.7	1.2	1.4	1.6
GCB	4.9	5.0	5.7	5.6	4.8	4.7	5.0	5.3
OSTT	8.3	7.7	8.3	8.3	9.1	10.8	12.2	14.4
LPG	1.1	0.7	1.3	2.3	3.0	3.2	3.4	3.6
Container Terminal	0.6	0.8	1.3	1.9	2.4	2.9	3.5	4.0
Total	54.5	56.1	59.2	62.8	67.2	72.8	78.0	89.7

Future berth occupancy will fall somewhat on the East and West Quay berths, as well as the OSTT. However, on all other berths, occupancies will rise further and well beyond congestion levels. Urgent measures are required to offset immediate problems.

Table 4-8 Future Berth Occupancy with current port configuration

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
EQ1-7	67%	73%	77%	79%	82%	86%	95%	103%
WQ1-7	75%	66%	69%	71%	72%	75%	82%	87%
WQ5	75%	63%	67%	67%	109%	166%	170%	252%
OR-1/OR-2	60%	77%	84%	87%	99%	120%	133%	157%
FB	52%	60%	68%	73%	77%	85%	90%	94%
OB-1	52%	65%	65%	70%	74%	74%	74%	85%
OB-2	62%	73%	73%	79%	83%	83%	83%	96%
NOM	88%	70%	53%	53%	46%	32%	36%	43%
GCB	104%	105%	121%	117%	101%	98%	105%	112%
OSTT	61%	56%	60%	60%	66%	79%	89%	105%
LPG	86%	53%	99%	175%	229%	244%	259%	274%
Container Terminal	29%	37%	60%	87%	110%	133%	161%	184%

From the table can be concluded that most of the berths will face a shortfall in capacity. In chapter 2, Table 2-5 and Table 2-7 the commodities handled at the several berths are mentioned. The following conclusions are drawn.

The main problems on the East Quays arise from the handling of fertilisers, predominantly on EQ-1-4. Over time, mechanisation and handling facilities for fertilisers on EQ5 and EQ7 can relieve pressure. This will free up space on berths 1 to 4 which can be developed for future developments.

Capacity utilisation on WQ 1-4 is also rising. The manual handling of thermal coal and iron ore on these berths results in high turnaround times and low productivity. Mechanisation of these streams may relieve much of the pressure and condense operations on fewer berths.

On WQ5 alumina is handled. Mechanisation of WQ7 can accommodate growth for this cargo and hence relieve pressure.

The Oil Refinery berths 1 and 2 are expected to see very high utilisation levels. The port is undertaking measures to offset at least part of the envisaged congestion.

The Fertiliser Berth in the Inner Harbour is privately owned. Expected throughput increases are essentially a problem to be dealt with by the private operator, CFL.

The Ore berths, OB-1 and OB-2, see moderately increasing utilisation, but still beyond the point of acceptable levels. Refurbishment of the existing handling equipment of the complex can tackle this issue.

The NOM, New Oil Mooring, handles POL cargoes. No immediate capacity problems are envisaged.

The GCB, on which coal imports are handled, is already used excessively. Part of the problems stem from the need to top off and then enter the Inner Harbour. Furthermore, low productivity results from the use of floating cranes and ship's gear. Mechanisation of this facility can improve the capacity and hence lower utilisation.

The Offshore Tanker Terminal, OSTT, is expected to be highly utilised. While additional capacity may be created outside the port to handle the Crude oil currently unloaded at the OSTT, redesign of the OSTT will be required.

The LPG berth is facing substantial excess use if no remedial measures were taken.

The Container Terminal is operated by a private company. The increase in cargo can be handled through additional equipment. In the longer term, further terminal area is required.

4.6 Marine services

4.6.1 Pilotage

The scheduling of pilotage movements is quite critical to ensure efficient marine services in the port. Visakhapatnam port had 2108 vessel calls during 2005-06. There was almost an equal split of 1055 calls at inner harbour and 1053 calls at outer harbour.

The number of vessel moves that can be performed during a day depends upon many factors, like sailing takes lesser time than berthing with a fact that lot of time is lapsed in passing mooring lines in berthing. The size of ship as well as the quay/berth position has impact in pilotage time. The channel size in width and the marine restrictions also has impact on pilotage.

In case of berthing, the time of pilotage recorded is measured from the time the pilot boards the ship at pilot boarding point till the moment some of the lines are secured with the bollard at the specific berth and tugs are released. In case of sailing the pilotage time is measured from the moment the pilot boards the ship at a specific berth till the time he leaves the ship at pilot point.

The time taken for berthing at the inner as well as the outer harbour is approximately 2 hrs and 15 minutes excluding the OSTT and the New Oil Mooring (NOM) where the time taken is almost 3 hrs and 15 minutes. Primarily the time difference is due to passing of extra mooring lines at OSTT and NOM compared to other berths.

The time taken for sailing at inner as well as the outer harbour is approximately 1 hr. this time decreases to as much as 35 minutes for sailing vessels close to the channel like OR1, OR2, WQ3 etc. The sailing pilotage for vessels at NOM and OSTT is approximately 1 hr 20 minutes and 1hr 30 minutes respectively.

The pilotage for vessels berthing and sailing consequently is normally done by separate pilots, however there are occasions when the pilot sails the vessel and directly board other vessel for berthing. It was understood that there is such possibility of almost 25%.

Presently many shiftings takes place from the GCB to inner harbour. In some cases the vessels at GCB after lightening are removed to anchorage due to tide restrictions and are subsequently brought into inner harbour, this is done to immediately accommodate the vessel waiting for GCB. If the previous vessel is allowed to continue to discharge further for few hours till the tide restriction is met this double shifting can be avoided, however the commercial obligations of traffic is to be viewed for this. Once the inner harbour is deepened such shifting could be reduced.

There is a proposal to widen the outer channel width from the existing 200 m to proposed 250 m. This will facilitate berthing of tankers having DWT greater than 150,000 tons. However, berthing of tankers exceeding 150,000 DWT will be done during day light only. The widening of the outer channel is included in the project ‘Up gradation of iron ore berth at outer harbour to cater to 200,000 DWT vessels and detailed for the estimate at chapter no. 7. The Port is taking a view to de-link widening of outer channel from the up-gradation of iron ore project.

The inner harbour is proposed to be deepened to handle vessels with draft of 14 m. This project will be dealt in detail detailed in chapter 7. This project is proposed to be done in stages:

- First Stage - Deepening and widening of Inner harbour entrance channel and turning circle from draft of 10.06 m to 11 m.
- Second Stage - Deepening of Inner harbour entrance channel and turning circle draft from 11.0 m to12.5 m. to be completed by December 2007.
- Third Stage – Deepening the inner harbour entrance channel and turning circle from draft of 12.5 m to 14 m, which is in consideration.

14 m draft shall be sufficient for Panamax vessels at inner harbour. The berthing and un-berthing of the Panamax vessels with limited inner harbour channel width and wind pressure due to funnelling is unsafe. Recently a navigation simulation study undertaken at MARIN revealed that navigation of 14 m draft Panamax vessels into Inner Harbour is technically feasible.

It is estimated that the total number of vessel calls in 2012-2013 shall be 2,851. In the year 2005 the number of vessel calls amounted to 2,044 and the highest number of daily moves performed 33 with an average of 23 moves per day. The existing resources in terms of channel capacity and the number of pilots will be sufficient for the future traffic estimate.

4.6.2 Towage

At present, VPT has 8 tugs of which 3 with a capacity of 50 tons and 5 of 30 tons. The life time of these tugs is about 20 years. The wind pressure, small outer harbour channel width and the layout of the OSTT, the LPG berth and the breakwater is such that drifting of a vessel during docking and un-docking could cause a substantial safety hazard. Due to limited width of channel and the inclined pull by the tug, not the entire available pulling power is used. Recently a study was carried out by Howe India and in which it is recommended to have tug capacity of 70 to 75 tons Bollard Pull for handling cape size vessels as well as night berthing in above conditions.

As the lifetime of the tug is estimated at 20 years, two tug boats of 30 tons each are proposed for replacement, and these projects are included in the NMPT project under ‘Replacement of tug Swarna’ to be completed in 2010 and ‘Replacement of tug Nethravathi’ to be completed by 2012.

In case VLCC’s will be handled at the SBM two tug boats of 70 to 75 tons will be required, which implies the investment in a second tug boat with the same capacity.

4.6.3 Navigation aids and systems

The existing Automatic Information System (AIS) and the recent proposal to have invested in a radar system at the marine control tower shall be sufficient for the navigation of the vessels. The layout of the port is such that a technology such as a VTMS is not required. However, the marine services will be the core competence of the port. Looking at the future challenges the need for more sophisticated aids to navigation could be required, which will be discussed in the chapter 8.

4.6.4 Conclusion and recommendations

In general it can be stated that the capacity for the marine services in term of pilots and tug boats is sufficient for the present ships calling at the Port. For the handling of Cape size vessels the following investments would be necessary:

- The replacement of the 2 tugs of 30 tons each.
- To enable night berthing it is recommended to purchase a tug boat of 70 to 75 tons bollard pull and to widen the entrance channel near the harbour mouth.
- In case VLCC will be handled at the SBM, NOM facility and probably also for the OSTT at least two tugboats of 70 to 75 tons bollard pull will be required.

5. INVESTMENTS IN PORT HANDLING CAPACITY

5.1 Introduction

This chapter describes the investment projects that will be implemented in order to cope with the future demand. The shortfall in capacity is determined in the previous chapter. The Consultants have discussed the projects, as were listed in the interim report, with VPT and the investment programme for the plan period. Compared with the projects as have been listed in the interim report the following major changes have been decided upon:

- The relocation of the container terminal will not be implemented, and it is proposed to extend the terminal in the panning period;
- The project for the mechanisation of the GCB will be expanded with another berth in the inner harbour;
- The deepening of the inner harbour up to a vessel draft of 14 m will be postponed;
- The deepening of the berths EQ 1- 3 will be postponed;
- The east docks will be developed and partly as an expansion to the GCB;

The main projects to be implemented during the planning period are given in Table 5-1 and will be described taking into account the following items:

- General description and motivation
- Potential throughput is based on the traffic forecast
- Capacity
- Investment and operational costs
- Feasibility of the project
- Manpower
- Implementation period

For the financial evaluation, the following assumptions are used:

- All costs and revenues have been held constant in 2005-2006 terms
- The discount rate used in the net present value calculation is 8%. This rate is arrived at from the following components:
    - Risk free real rate of 4%
    - Market premium of 2%
    - Country risk: 2%
- The labour costs have been held constant. The real wage increase that is typically observed is entirely compensated for through productivity gains.

In the interim report several projects were discussed. The table below lists these projects and gives the present status for implementation.

Table 5-1 Summary of projects

Project	Capacity Mt	Cost Rs Crore.	Decision made
Export facility for Bulk Cargo WQ1/WQ2	3-6	117	
Import facility Granular fertiliser EQ1-3	4-10	77	Concession in the future
Mechanisation General Cargo Berth	11	237	Implement via Concession
Deep Water Dry Bulk terminal	16	385	Rejected
Deepening Inner harbour to 14m draft	3*	150	Not viable, implementation on hold
200k Dwt vessels Iron Ore Jetty	3.5*	50	Implementation via VPT
POL jetty		113	Rejected
Relocation Oil mooring		30	Implementation VP
SBM facility	15	540	Implementation via Concession
Relocation of container terminal		99	Rejected
East Docks development	8.5	207	Implementation in phases via Concession
Replacement equipment Iron Ore Handling complex and remaining costs on upgrading complex		203	Implementation via VPT
Extension Container Terminal	4	120	Implementation via Concession
Total main projects		1,834	
Total other waterside related projects		551	
Grand total		2,385	

Note: * capacity based on targeted cargo.

The projects listed above account for well over 70 Mt of capacity. Part of this is replacement of existing capacity, as mechanisation is undertaken. Some projects have relatively short lead times and consultants advise that these should be undertaken as soon as possible to relieve the congestion. The other projects require lead times due to the necessity of further detailed analysis and the simple reason that substantial construction is to be undertaken.

Several projects have been discussed in detail in the Interim Report, which have subsequently been rejected. This relates to the Deep water dry bulk terminal, the multi-purpose berths at Lova Garden, the new POL jetty in the Outer Harbour as well as the relocation of the container terminal. The reader is referred to the Interim Report for further information on these projects.

5.2 Export facility for Bulk Cargo at berth WQ 1 and 2

5.2.1 General description and motivation

Dry bulk, in specific, the import and export of coal is handled at almost all west and east quays in the inner harbour and at the General Cargo berth at the outer harbour.

Thermal coal is presently manually loaded with slings, mainly at the west quays, which result in a long TRT for ships and high berth occupancies. According to the data from 2005-2006 the average berth time for 40,000 DWT ships was 3.5 days. The berth time and hence the loading time of ships carrying thermal coal can be improved by the development of a mechanized loading and stacking facility. The coal will be stacked in a stacking yard along the quays and transported to the quay by belt conveyors. Loading rates of 25,000 ton per day can be achieved using a ship loader with a capacity of 1,500 ton/hr. The facility will also be destined for the export of iron ore.

The result of the realisation of such a loading facility is that operations are environmentally friendlier than the present operations, due to the fact that e.g. coal is concentrated at one location and is less handled by varies types of equipment. Loading rates are much higher and ships have a shorter turn around time in the port and can save on the ship cost.

5.2.2 Technical description

The complete bulk export facility consists of a train unloading station, a stacking yard, stackers, reclaimers and a ship loader. The total throughput capacity of WQ 1 and 2 is estimated to be around 6 million ton per year.

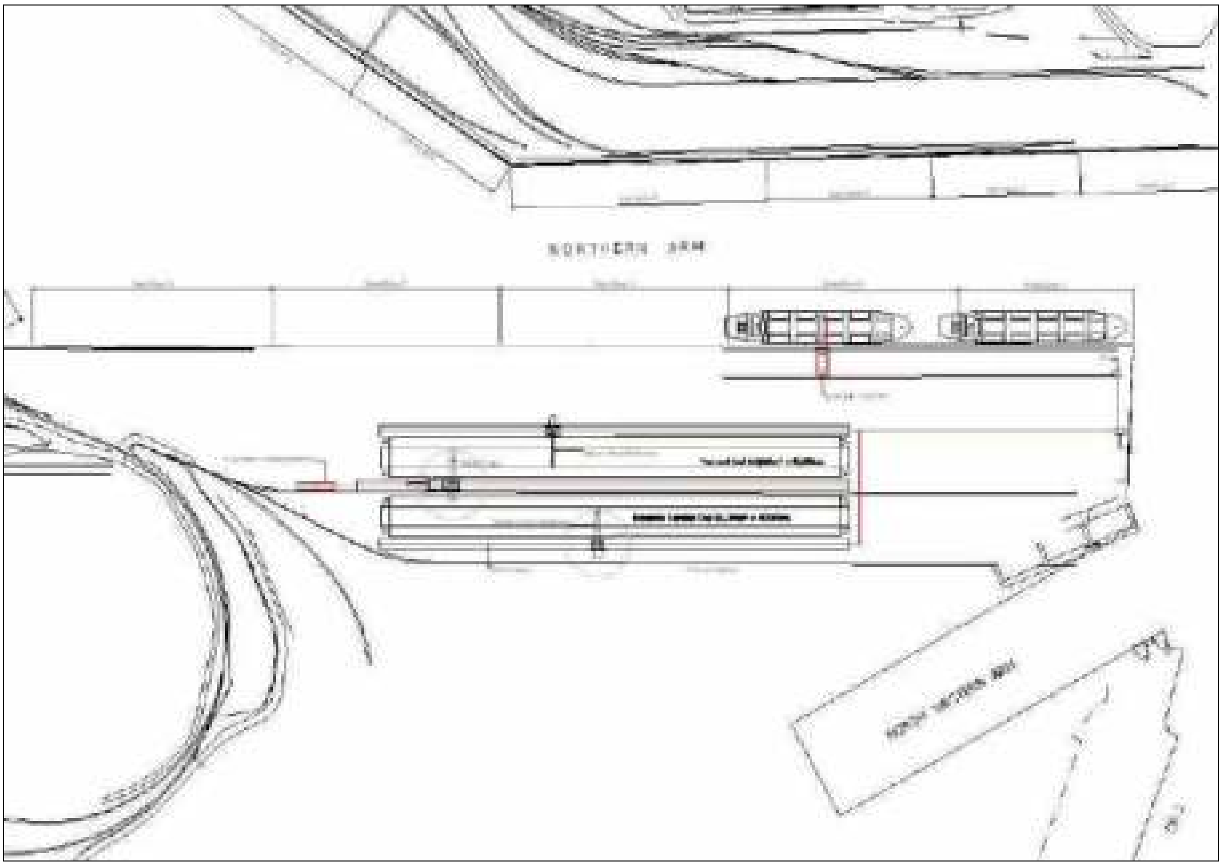
Train unloading can be done in several ways, with wagon bottom unloaders dumping the coal in a receiving pit, by a wagon tippler installation or manually. For the handling of coal the last option has been selected due to economic and social reasons. In the medium and long term the exports of thermal coal may decrease or even disappear. Each wagon of the rake is unloaded at a special rail track with a reception tunnel with a belt conveyor along side. The rake can be unloaded in 3 hrs (present rates according to VPT), each rake contains about 3.500 ton and the unloading rate is about 1.100 tons per hour. The facility will also be used for the export of iron ore, for which the tippler system at the OHC will be used for discharging the rakes. A conveyor belt will be needed from the iron ore stack to the loader.

A belt conveyor transports the product via a stacker (1.200tph) to the stack yard. The capacity of the stack yard will be about 80.000 ton sufficient for a throughput of about 3 million ton per year. Sufficient space is available near the quay to double the capacity of the stacking yard. A reclaimer with a capacity of 1.500 tph and a belt conveyor transport the coal to the ship loader via a tripper. The ship loader and tripper car will travel over rails at the berths WQ 1 and 2. In this case both berth WQ 1 and 2 can be used for loading. Expansion to the WQ 3 and 4 is also a possibility.

Both quays WQ 1 and WQ 2 need to be replaced or be strengthened in case that the berths need to be made suitable for 12.5 draft. The port in Chennai to which the thermal coal is exported has a draft of 12.5m. The layout details are presented in Map 5-1.

The final lay-out of the berths will depend on the types of vessel calling.

Map 5-1 The mechanical bulk facility on the WQ's



5.2.3 Financial feasibility

The total future annual throughput of berth WQ1 is 3 Mt while this can be doubled to 6 Mt per year in case that also berth WQ 2 will be used. At present the total capacity of berths WQ1 and 2 is about 2.5 Mt per year. The future capacity will be more than doubled. This implies that other berths, such as WQ 3, 4, 5 and 7 where thermal coal is presently handled gets more room for other cargo.

The existing facility is using manual labour, resulting in low turn-around-times. TNEB has dedicated vessels on the trade, which also call at Paradip port, where mechanised facilities are used. These vessels are approximately 50,000 DWT, with an average load of 35,000 ton. In order to retain the trade, the mechanisation of the export facility is initiated. This will also free up berth space. For the financial feasibility, the retaining of the cargo of 2.7 Mt per annum over 20 years is assumed. Berth days are calculated to fall to 2.0 per call, down from around 3.6 currently. No increase in parcel size is expected, so that the calls will remain similar, at around 90 per year. The economic benefits accruing to TNEB are in the order of 140 days of ship time not alongside. The actual cost saving to TNEB is unknown, but a time-charter equivalent of approximately 15,000 USD/day can be used for the local trade, indicating that the annual savings to TNEB are in the order of 2.1 million USD per annum or 42 million USD over a 20 years period.

Apart from the Thermal coal being handled, Iron Ore is handled at the berths as well. Currently around 1.5 - 1.6 Mt is being handled for exports. The average parcel size is currently 27,000 Mt, with vessels of on average 43,000 DWT. It is envisaged that the parcel size will increase once the water depths have been increased. Berth days are envisaged to fall from 3.3 days to below 2 days, providing considerable savings to the shipper.

The incremental throughput over the two berths is estimated at 1 Mt per year.

The total investment is as follows:

Table 5-2 Investment mechanisation WQ1 and WQ2

	Number	Capacity (Mt/yr)	Cost USD (Million)	Cost Rs. Crore
Receiving facility (Manual Unloading trains)		6.1	2.0	9.0
Belt Conveyors to the stack			3.0	13.5
Stackers	1	6.6	4.0	18.0
Reclaimer	1	8.3	5.0	22.5
Transfer Towers			0.3	1.4
Ship loader/ Mobile crane	1+1	6.2	4.5	20.2
Rails Loader			0.2	0.7
Mechanical Works			2.0	9.0
Civil works			5.0	22.5
Total			**26.0**	**116.8**

On the income side for the port, the facility will generate wharfage of 26 Rs/ton and mechanical handling revenues of 36.5 Rs per ton. These tariffs are in line with the current mechanical handling of Iron Ore. The current revenues consist only of a wharfage fee of 15 Rs per tonne for thermal coal and 13.5 Rs/tonne for conventional handling of Iron Ore and Pellets. The envisaged increase is possible due to the improved services provided. From a competitive point of view, Paradip is charging similar rates for mechanised coal handling.

It is estimated that the current number of staff involved in the manual loading of the vessel with thermal coal and Iron Ore is around 130 workers, with an average all-inclusive salary of 215,000 Rs/yr. Total salary amounts to 2.8 Crore/yr.

Table 5-3 Details of the financial feasibility in the new situation (Crore Rs)

		Year									
		-2	-1	1	2	3	4	5	10	15	20
Throughput (Mt)	Coal			2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
	Iron Ore			1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
	Total			4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
	Incremental			1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Revenues	Wharfage			11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
	Handling			16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
	Total			28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1
Operating cost	Labour			1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
	R & M. Consumables			4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
	Other			0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Total			6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Depreciation				5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Total cost				12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
Net Income				21.7	21.7	21.7	21.7	21.7	21.7	21.7	21.7
Capex		11.2	105.5						13.5		
Cash flow	New situation	-11.2	-105.5	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4
	Current situation	0.0	0.0	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
	New-Old	-11.2	-105.5	24.7	24.7	24.7	24.7	24.7	11.2	24.7	24.7

In the new situation, the staff for the mechanical facility is estimated at 60 workers per year. Average labour costs will be higher than for the manual unloading, as higher qualification is required. Total salary costs are thus 290,000 Rs/yr for 60 staff, or 1.7 Crore Rs/yr.

Table 5-4 Comparison of Current and New situation parameters

		Current	New
Staff		130	60
Average salary * (Lakh Rs.)		2.1	2.9
Total labour cost, Crore Rs/yr		2.8	1.7
Wharfage:	Coal	15.0	26.0
	Iron Ore	13.5	26.0
Handling:	Coal	-	36.5
	Iron Ore	-	36.5

* includes payments of pensions and other benefits, calculations

Maintenance cost on the civil works: 1.5% p.a., equipment excluding the conveyor belts: 3% p.a. and the conveyor belts 6% p.a. The conveyor belts will be replaced after 10 years.

The project has an incremental IRR of 22%.The operating cost is around 13 Rs per ton for the new facility against around 8 Rs per ton in the current situation. The net income in the new situation is approximately 42 Rs/tonne. The current situation is generating positive income to the port of around 6 Rs/tonne. The Net Present Value of the new project is 124 Crore Rs when discounting at 8%.

Table 5-5 Summary table of financial feasibility

Item	Current situation	New situation	Incremental
Labour cost, Rs/tonne	5.4	3.3	-2.1
Total operating Cost, Rs/tonne	8.1	12.6	4.5
Net income, Rs/tonne	6.4	41.8	35.4
IRR, %		22%	20%
NPV @ 8%, Crore Rs.	226	124	102

Consultant's recommendation

The project is generating an IRR of 22% on its own merits. Compared when the old situation, the IRR based on additional income the IRR will amount to 20%. The project frees up two berths on the West Quays, which will be available for other cargoes. Significant cost reductions are realised in terms of TRT for the vessels, which benefits the clients. Also the port will have additional benefits due to the reduced waiting times and shifting requirements. Consultants are of the opinion that the project is viable from a financial and economic point of view.

5.2.4 Implementation

In order to improve the handling productivity on the short term, VPT wants to use mobile cranes.
The project will be implemented via PSP and the tender will be brought on the market in the beginning of 2007. The following time frame is anticipated:

Table 5-6 Time frame

Action	Date or period
Proposal to the board	January 2007
Permission of GoI	March 2007
EoI for the project	April 2007
Request for Proposals	August 2007
Finalisation of Bids	December 2007
Award of the concession contract	February 2008
Start of Construction including design	March 2008
Start of Operations	January 2009

The investment for VPT is to strengthen the quay walls, for which a period of 15 months is foreseen, which consists of the time needed for the tender procedure (3 months) and strengthening the quay walls (12 months). The project could start in the beginning of 2007.

5.3 Re-organisation of fertiliser handling

Fertilizers are imported as urea and raw materials such as rock phosphate and sulphur. A dedicated private owned facility is located at the fertilizer berth (FB) its imports through this facility are limited to own use. The throughput in 2005-2006 via this facility was 850,000 ton while the total throughput in the port was 3.2 million. This implies that about 2.3 million ton was handled in other locations in the port, predominately at the East Quays (EQ) 1 through 9 and in the outer harbour at the GCB. Ms. Tinna has concluded a concession contract to handle fertilizers on EQ 5 and negotiations are ongoing with another private operator to handle fertilizers on EQ 7, with a storage facility located behind quays 5 and 7

Fertilizers at berth EQ 5 and EQ 7 will be handled under a BOT agreement with private operators. The products will be unloaded and transported to warehouses at the port. The operators will submit their operations plan for unloading the fertilizer in a proper way including the transport to the storage facilities. The VPT require that the ships will be unloaded by mobile quay cranes or ships gear. Properly designed hopper with mobile belt conveyors to the warehouses will create an efficient and environmentally friendly solution. The use of a mobile crane will result in unloading rates of about 7 ton per day per gang. Two mobile cranes obviously will create an unloading rate of about 14 ton per day per ship. The private operator should invest in mobile cranes, fixed or mobile belt of link conveyors, hoppers at the quay and storage facilities for the fertilizer such as warehouses. The loading of the warehouse can be mechanized as well by means of an overhead belt conveyor and an overhead travelling bridge. Outtake can be performed by payloaders, which will load the trucks of by means of mobile hoppers with a belt conveyor along side the warehouse.

The general cargo will be shifted from these berths to the West Quays. Mobile cranes are already foreseen and as such no further investments are required.

5.4 East Docks and Strengthening East Quays 1-4

5.4.1 General description and motivation

Due to the deepening of the inner harbour several berths at the East Quays need to be strengthened or replaced due to the fact that the deepening goes beyond the design depths of these berths. Besides this, the quays were constructed in 1937 and have exceeded the design life time.

The involved berths according to the VPT are quays, EQ 1, 2, 3, 4, 5, 6, and 7. The EQ 1-4 will be upgraded to a vessel draft of 14 m and will be constructed about 25m from the original water line in order to widen the channel. It has been decided that only East Quays 1 through 4 will be revamped and upgraded to 14 m draft capability as and when sufficient traffic justifies the investment. The project will be implemented via a concession with a potential operator.

In addition to the East Quays, the East Docks will be developed for the handling of general cargo and for coal.

5.4.2 Technical description

The East Docks will be developed south of the East Quays. The space is used for several dry bulk berths. On the North side, directly adjacent to the East Quays, it is envisaged to develop fertiliser handling capacity. On the South side, a quay for mechanised coal handling is foreseen. This latter project will be connected to the mechanisation of the GCB and use the same stack-area. The East Docks will be constructed for reception of Panamax bulkers, but initially be dredged to allow upto 12.5m vessel draft. This project will reduce the need of deepening other parts of the Inner Harbour and create immediate capacity for coal handling with reduced capital outlays due to integration with new facilities under development.

Map 5-2 The lay-out of the East Docks and Rehabilitation of East Quays 1 through 4

5.4.3 Investment cost

The total infrastructure cost of the project is estimated at Rs 207 Cr, of which Rs 30 Cr is for account of VPT, with the remainder for account of the private operator. This includes superstructure and equipment.

5.4.4 Implementation

The project will be implemented via PSP, though with different operators. The coal terminal will be integrated with the existing GCB mechanisation, which will require a specific rider to the concession agreement that will be concluded on that terminal.

5.5 The Mechanization of the General Cargo Berth

5.5.1 General description and motivation

The existing general cargo berth consists of a quay wall of 356m and can receive ships up to a draft of 14.5m. The quay wall is designed for drafts up to 15m and vessels up to 100,000 DWT. The berth is used for only import of dry bulk such as coking coal, coke and fertilizer. Unloading is done by either ships gear or two floating cranes. In case ship gear is used the average output per ship per berth day is 5,200 ton per day. Using the floating cranes the output is 10,200 ton per day.

In 2005 – 2006 the cargo throughput at the GCB was about 5 Mt, resulting in berth occupancy of about 98% assuming that the GCB consist of 1.5 to 2 ship berths, depending on the size of the ships. In 2005-2006 an equal amount of about 5 Mt of coal and coke was imported through the inner harbour. According to the market study, the expected amount of imported coking coal and coke is in the order of 11.0 Mt per year.

In June 2006, IPA has conducted an extensive feasibility study for the mechanization of the General Cargo Berth. Several data of this study has been used by the consultants, especially the proposed equipment, handling rates and cost estimates.

An increase of the handling capacity will increase the throughput for the General Cargo Berth, since present rate are low. This can be realized with a mechanized unloading facility in combination with a stacking yard with stacker-reclaimers and wagon loading installation. The facility should be capable of the handling of all imported coal and coke up to 10 or 11 Mt per year.

The total infrastructure cost of the project for the refurbishment of the GCB is estimated at Rs 237 Cr, of which Rs 30 Cr is for account of VPT, with the remainder for account of the private operator. The cost of mechanised coal handling facilities, including conveyor belts and an interchange at the stack yard for the conveyor belt from the GCB, is estimated to cost Rs 60 Cr, entirely for account of the concessionaire. The investment costs for the inclusion of the berths and equipment in the East Docks is estimated at Rs 103 Cr.

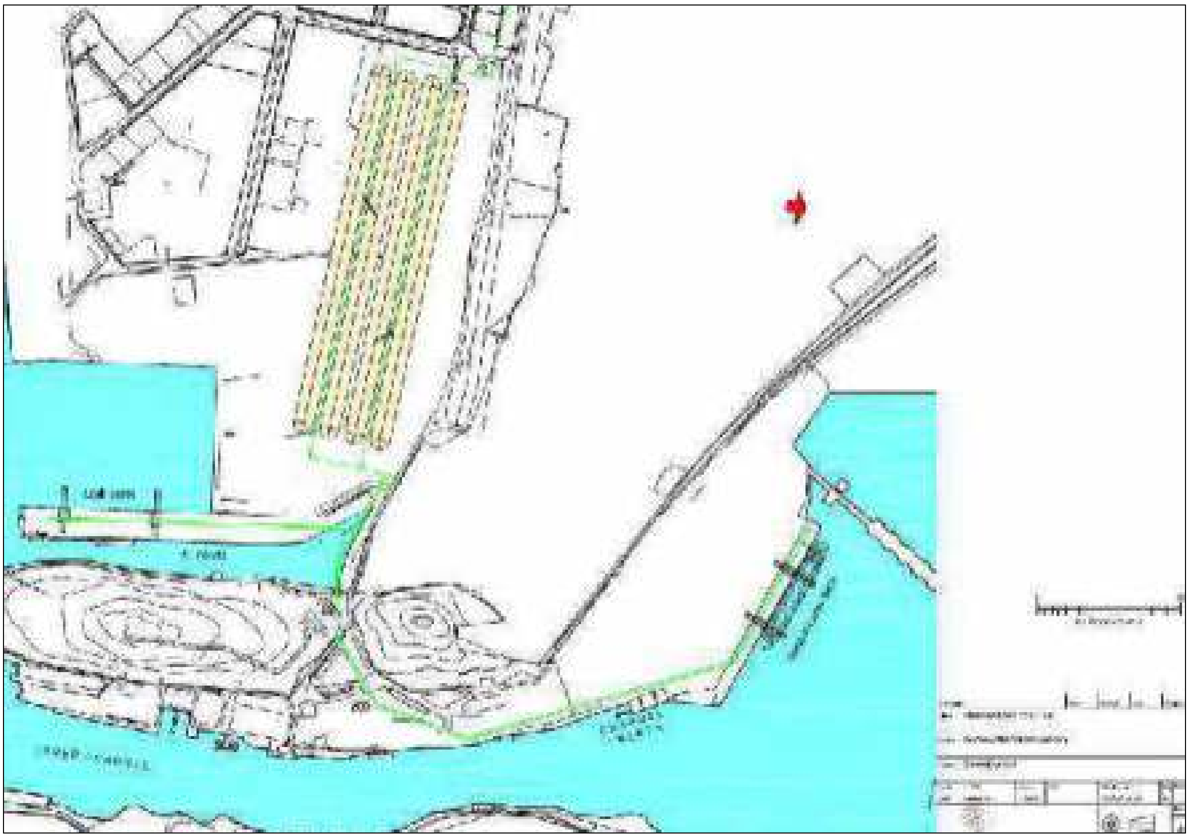
Implementation

The project will be implemented via PSP, though with different operators. The coal terminal will be integrated with the existing GCB mechanisation, which will require a specific rider to the concession agreement that will be concluded on that terminal. The following time frame is anticipated:

Table 5-7

Action	Date or period, North side	Date or period, Coal terminal
Proposal to the board	2007	Is to be integrated with GCB mechanisation
Permission of GoI	2007	
EoI for the project	2007	
Request for Proposals	2007	
Finalisation of Bids	2008	
Award of the concession contract	2008	
Start of Construction including design	2008	2008
Start of Operations	2009	2009

Map 5-3 General cargo Berth in the Outer Harbour



5.5.2 Technical description

The mechanization of the GCB berth by two grab unloaders will create additional capacity. It is estimated that a capacity of 50,000 ton per day can be achieved which will result in a maximum capacity of about 11 Mt per year. This capacity depends highly on ship sizes. The berth is about 350m long and can accommodate 2 smaller vessels simultaneously or one large vessel. For the capacity calculations 1.5 available berths at the GCB has been assumed.

The bulk material is unloaded from the ship at the general cargo berth with two gantry grab unloaders with a capacity of each 1,500 tons per hour. With two parallel lines of belt conveyors the bulk material is transported to the stack yard. Each conveyor line has a capacity of 2,000 tons per hour. With two stackers/ reclaimers of each 3,500 tons per hour the bulk material is stacked to the four parallel piles.

The loading of the bulk material to the train wagons takes place with the two stackers/ reclaimers at the stock piles. Belt conveyors with a capacity of 4,000 tons per hour transfer the bulk materials to the loading station for train wagons.

5.5.3 Feasibility of the project

The existing facility is using a combination of manual labour and privately held floating cranes. Turn-around-times are comparatively high and clients are forced to shift from the berth to the Inner Harbour or temporarily back to the anchorage in order to make room for other vessels. The shifting has a major impact on the capacity of the berth and in addition puts unnecessary demands on the Marine Services department.

The vessels are approximately 40 to 55,000 DWT, with an average load of 30 to 35,000 tons respectively. In order to clear the bottlenecks caused by this situation, the mechanisation of the import facility is initiated. This will also free up berth space in the Inner Harbour, as cokes and coals are also handled on the East and West Quays. For the financial feasibility, all coal and cokes cargo will be relocated from the Inner Harbour to the new facility. The throughputs over the 20 year-period is in accordance with the traffic forecast for these cargoes, although the cargo is capped at the maximum capacity of the facility. Berth days are calculated to fall to 1.0 days for coking and steam coal per call and 1.2 days per call for the cokes products, down from around 3.6 to 7.0 days currently. No increase in parcel size is expected, so that the calls will remain similar for the same amount of throughput. The current amount of ship berth days to offload the cargo is around 1465 days, whereas a similar amount of cargo in a new situation would require 500 berth days. The economic benefits accruing to the clients are in the order of 965 days of ship time not alongside.

The vessel cost saving is estimated to be in the order of 20 USD/Million per year. This calculation is based on a time-charter equivalent of 20,000 USD/day for a 45,000 DWT vessel as has been prevailing in the past few years. Yet, even at the prevailing rates of the 1990s of around 10,000 USD/day, the benefits are still in the order of 10 USD/Million per year. Apart from these savings, the client will save considerably on berth hire, pilotage and towage due to the near-absence of shifting. For VPT, this will result in a direct fall in marine income. The consultants regard this as an item that should be ignored in the evaluation, as these incomes are ‘unnatural’ due to bottlenecks in the system.

The investment in the facility is as follows:

Table 5-8 Investment mechanisation General Cargo Berth Outer Harbour

	Number	Capacity (Million tons/yr)	Cost USD (Million)	Cost Rs. Crore
Grab unloaders	2	16.6	8.8	39.6
Belt conveyors			11.5	51.8
Hoppers			1.0	4.5
Stacker / Reclaimers			12.0	54.0
Transfer towers			1.0	4.5
Wagon loader		19.8	4.0	18.0
Rails Loader			0.5	2.3
Mechanical Works			3.0	13.5
Civil Works			11.0	49.5
Total			**52.8**	**237.7**

On the income side for the port, the facility will generate wharfage of 26 Rs/ton and mechanical handling revenues of 36.5 Rs per ton. These tariffs are the same as the current ones. The current revenues consist of the wharfage as well as storage. The effective storage fee equals of 3.5 Rs per tonne handled, which is a reflection of the tariff and the average days the goods are stored. Most of the handling is done with ship's gear and privately owned floating cranes. The mechanised facility will thus replace a very substantial part of this private business.

It is estimated that the current number of port staff involved in the manual unloading of the coal and cokes is around 115 on the GCB with an additional 70 staff in the inner Harbours. The average all-inclusive salary is estimated at 300,000 Rs/yr. Total salary amounts to 5.5 Crore/yr. In the new situation, the staff for the mechanical facility is estimated at 100 workers per year. Total salary costs are kept at 300,000 Rs/yr for 100 staff, or 3.0 Crore Rs/yr.

The current capacity includes the throughput of cargo over the Inner Harbour berths of cargo that will be handled at the GCB in the future. The incremental cargo is estimated at 2 Mt on the new berth in the medium term.

Table 5-9 Comparison of Current and New situation parameters

		Current	New
Staff		185	100
Average salary * (Lakh Rs.)		3.0	3.0
Total labour cost, Crore Rs/yr		5.5	3.0
Wharfage:	Coal	26.0	26.0
Handling:	Coal	-	36.5
Storage	Coal	3.5	3.5
Capacity	Mt/yr	10	12

* includes payments of pensions and other benefits, calculations

For maintenance cost the following has been assumed: on the civil works, 1.5% p.a.of the investment, equipment excluding the conveyor belts, 3% p.a. and for the conveyor belts 6% per year. The conveyor belts will be replaced after 10 years.

The project has an IRR of 21% based on an operating cost of around 12 Rs per tonne for the new facility. Compared with the old situation the operation costs are 5 Rs per tonne higher. The net income in the new situation is approximately 42 Rs/tonne against around 22 Rs/tonne in the current situation.

The Net Present Value of the new project is 253 Crore Rs when discounting at 8%.

Table 5-10 Summary table of financial feasibility

Item	Current situation	New situation	Incremental
Labour cost, Rs/tonne	5.0	2.9	-2.1
Total operating Cost, Rs/tonne	7	12	5
Net income, Rs/tonne	22	42	20
IRR, %		21.0%	11.8%
NPV @ 8%, Crore Rs.	183	253	70

Table 5-11 Details of the financial feasibility in the new situation, Crore Rs.

		Year									
		-2	-1	1	2	3	4	5	10	15	20
Throughput (Mt)	Coal (all sorts)			9.0	9.3	9.5	9.8	10.5	12.0	12.0	12.0
	Incremental			0.2	0.3	0.3	0.3	0.5	2.0	2.0	2.0
Revenues	Wharfage			23.4	24.2	24.7	25.5	27.2	31.1	31.2	31.2
	Handling			32.5	33.6	34.3	35.4	37.7	43.2	43.3	43.3
	Storage			3.2	3.3	3.3	3.4	3.7	4.2	4.2	4.2
	Total			59.1	61.0	62.3	64.3	68.6	78.5	78.7	78.7
Operating cost	Labour			3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	R & M, Consumables			9.1	9.1	9.2	9.2	9.3	9.7	9.7	9.7
	Other			1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3
	Total			13.5	13.6	13.6	13.7	13.8	14.2	14.2	14.2
Depreciation				12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Total cost				26.2	26.3	26.3	26.4	26.5	26.8	26.8	26.8
Net Income				32.9	34.8	36.0	37.9	42.1	51.7	51.9	51.9
Capex		24.8	212.9						51.8		
Cash flow	New situation	-24.8	-212.9	45.5	47.4	48.7	50.6	54.7	12.6	64.6	64.6
	Current situation			19.1	19.7	20.3	21.2	22.7	22.7	22.7	22.7
	New-Old	-24.8	-212.8	26.4	27.7	28.4	29.4	32.1	-10.1	41.9	41.9

Consultant's Recommendation

The project is generating an IRR of 21% on its own merits. Compared with the present situation and only counting the additional cash flow, the IRR comes to 12%. The current situation on the GCB alone is providing a very attractive return from a purely financial perspective. In the new situation the VPT will have less income from the marine services provided and the berth hire. The economic benefits of the projects will be cashed by the client, due to the savings in port costs and time savings for the vessel. Consultants are of the opinion that the project is viable from a financial and economic point of view and implement the project as soon as possible.

5.5.4 Implementation

The project is currently under development and fast tracked in order to improve the handling operations as soon as possible. The project will be implemented via PSP and the tender will be brought on the market in the beginning of 2007. The following time frame is anticipated:

Table 5-12

Action	Date or period
Proposal to the board	2006
Permission of GoI	Early 2007
EoI for the project	Early 2007
Request for Proposals	Early 2007
Finalisation of Bids	Mid 2007
Award of the concession contract	Late 2007
Start of Construction including design	Late 2007
Start of Operations	Late 2008

The investment for VPT is to strengthen the stack area and construct rail track, for which a period of 6 months is foreseen, which consists of the time needed for the tender procedure (3 months) and strengthening the quay walls (12 months). The project could start late 2008.

5.6 Upgrading the iron ore jetty for 200,000 DWT

5.6.1 General description and motivation

The iron-ore jetty has two berth OB-1 and OB-2 with a draft of 16.5m and 270m of berth length. The total throughput in 2005-2006 of the loading iron ore (fines and pellets) was about 14 million tons. The berth occupancies were about 60% for both berths. Calculation show that this is below the present capacity of the ship loader (8,000tph), belt conveyors and reclaiming in the stacking yard. The present equipment (replacement might be necessary) should be able to handle 20 million ton with berth occupancy of 60%. The improvements should be sought in solving bottlenecks in the loading line to the ships and stacking area.

5.6.2 Technical description

The loading rates for iron ore seem low comparing to the actual design capacity of the installation. The main reasons given by VPT are the life time of the installation; most parts are more than 30 years old. Various components need urgent replacement. The ship loader was originally designed for the handling of lumps, now fines are handled. The stack yard has constrains. Sometimes it stores cargo for more than 20 different clients which cause inefficiencies when reclaiming the ore. In addition to the above, replacements of the present equipment are foreseen in the near future.

Various improvements have already been initiated by the VPT according to a detailed feasibility report of October 2005 by HOWE PVT Limited. In the report a study has been performed to the technical feasibility to make the jetty suitable for vessels up to 200,000 DWT. According to this report, it is possible. Exporters should however indicate how often these vessels will be used in Visakhapatnam to verify the financial feasibility.

In combination with the extension of the ore jetty in the Outer Harbour, the port has decided to replace the main items of equipment of the Ore Handling Complex. This investment includes a bucket wheel reclaimer, and the stacker and smaller items. The ship loader, a stacker and reclaimer are for example built in 1976 and have exceeded their technical life time. The costs for these investments should come from the reserved funds from the depreciation. The total cost is estimated at around 150 Cr. Rs. This investment is covered by a loan provided by the Japanese Bank for International Cooperation (JBIC) and is currently underway. The project will be operational by 2008.

5.6.3 Financial feasibility and coverage

The accommodation of 200,000 DWT vessels at the Ore Berth in the Outer Harbour will require dredging and installation of a Mooring Dolphin. The facility will improve the logistics for exports of Iron Ore for certain clients. The total investment for the dredging and the adjustment to the jetty has been estimated at 50 Crore Rs. The cost for solving bottlenecks is difficult to estimate without a proper and detailed equipment assessment.

At this point, no additional cargo is expected to arrive for this investment. The larger vessels will simply displace smaller vessels. The throughput related to the project is estimated at 3.5 Mt of Iron Ore. The Iron Ore estimate is based on the feasibility study carried out earlier for VPT on the extension of the Iron Ore jetty. However, the construction of the extension will prevent a loss of cargo to Gangavaram.

The coverage of the replacement investment ought to be covered from the reserve fund. As such this replacement investment is not included in the financial feasibility.

Table 5-13 Summary table of financial feasibility

Item	Current situation	New situation	Incremental
Total operating Cost, Rs/tonne	0	2.1	2.1
Net income, Rs/tonne	35	25	25
IRR, %		17.7%	17.7%
NPV @ 8%, Crore Rs.	102	37	37

Consultant's Recommendation

The project has a positive incremental IRR. The Net Present Value of the new project alone is 37 Crore Rs when discounting at 8%. The operating cost is around 2 Rs per ton for the new facility. The net income in the new situation is approximately 25 Rs/tonne. The current situation would no longer generate revenues, as the cargo would be lost to another port. As cargo loss is prevented, the incremental results are identical to the New results.

5.6.4 Implementation

The project is currently being implemented by VPT, including the replacement of the equipment. VPT has obtained a Yen-denominated loan from the JBIC, at an interest rate of 1.5%. This loan covers both the mooring and the replacement of the equipment. The project will be carried out by VPT and future operations too will be held with VPT. The following time frame is anticipated:

Table 5-14

Action	Date or period
Proposal to the board	2006
Permission of GoI	2006
Start of Construction including design	2007
Start of Operations	2008

5.7 Handling facility for POL

5.7.1 General description and motivation

POL products are both imported and exported through the port. In 2005-06, 2.3 million was exported, while about 2 million was imported. About 3.2 million ton including other liquids was handled at the OR-1 and OR-2 at the inner harbour. The berth occupancy was 60% and provides limited room for more POL products. The remaining POL was handled as transhipment at the Oil Mooring.

HPCL is expanding its refinery to be able to produce 15-16 Mt of petroleum products. This expansion requires a Crude Oil intake of 15 Mt, as the losses are minimal according to HPCL. The company estimates that 30% of the products produced will be exported, so that around 4.5 Mt of products are to be expected once the refinery is on stream. At that moment, 2011/12, HPCL will have installed a Single Buoy Mooring facility south of the breakwaters. In the monsoon period it is expected that the facility will not be operational for about 60 days per year and this operational loss will have to be accommodated in some other way. This could be by using the OSTT in the Outer Harbour for this period in which case approximately 3 Mt have to be handled. This translates into some 20 vessel calls of 150,000 Dwt vessels. The introduction of the SBM implies a significant freefall of jetty-capacity on the OSTT.

The increase of the POL for HPCL is however a bottleneck in the future. To a large extent, the increase in cargo throughput is offset in two ways. At present, HPCL has around 12 tanker calls per month at the OR1 and OR2 , against 6-7 calls by the other oil companies. HPCL wishes to switch to larger product tankers, but maintain the same frequency of 12 calls per month. The size increases from the current of around 25,000 Dwt to vessels of 40,000 Dwt. These vessels require a vessel draft of 12 meters and a jetty of 195 meters length. The required modifications to the jetties can be undertaken without hindrance of the cargo handling. At the same time, as and when the refinery is commissioned, the company will be able to increase the pumping rates to the loading arms. On the Oil-Refinery Berths 1 and 2, the expected loading rates will therewith double from the current 300-400 ton/hour to 600-800 ton/hour. HPCL expects to handle around 3 Mt on these berths.

The balance of 1.5 Mt will need to be handled elsewhere in the port.

Two solutions exist. The OSTT may be modified to accept this 1.5 Mt. However, major modifications may be required, in any case to accept the smaller tankers and product lines will have to be laid in order to pump product to the tankers. The company has not yet made a cost calculation for this option.

Another solution is to use the product lines on the LPG jetty. Currently, very few lines are available at the jetty, as HPCL expects to export more different products, new lines are required. Furthermore, the length of the lines is over 4 km and this leads to substantial pressure loss in the line between the refinery and the loading arm. The present loading rate is around 500 ton/hour. The company is considering installing booster stations within 2-3 years, so that pumping rates of 800-1,000 ton/hour can be achieved.

TOTAL is using the LPG jetty for LPG and will also switch to larger tankers. According to HPCL, the requirement of TOTAL will remain around 3-4 vessel calls per month and the same frequency will be required for HPCL, on the basis of the 1.5 Mt of residual requirement and a vessel size of 40,000 Dwt. While this may lead to relatively high utilisation of the berth, it appears to be possible to accommodate the requirement with relatively minor modifications by HPCL. The unloading capacity will be extended to 1,000 M3 per hour.

The NOM will be moved to the other side of the turning circle in order to have operational flexibility in case transhipment is required.

The project for the handling of POL consists of:

- The modification of the existing OSTT
- The relocation of the NOM
- The adjustments for OR1 and OR2

5.7.2 Modification of existing OSTT

At present the OSTT is used for only crude import. In the near future, when the SBM is operational most crude will be handled at the SBM. However about 60 days per year, the SBM is not operational due to weather conditions. This implies that about 20% of all crude will be still be handled at the OSTT. The remaining capacity of the OSTT can be used for the handling of POL. The necessary adjustments are the installation of additional loading arms and pipe lines to the refinery.

5.7.3 Relocation of the NOM (New Oil Mooring)

As oil products exports are expected to rise, additional capacity is required. The location in the Outer Harbour is problematic, and a new separate POL jetty is not possible. An alternative solution of lengthening of and installation of double manifolds on the OSTT may neither be possible, due to the different technical requirements of the vessel sizes.

When the SBM becomes operational, still 20% of the crude will be discharged at the OSTT. 5Mt of products can be handled at the OSTT when the SBM is operational. A relocation of the current NOM is considered to a location between the LPG jetty and the OSTT. The cost is estimated at 30 Cr.

The location of the NOM is required due to the construction of the container terminal extension

5.7.4 Adjustments of OR1 and OR2

The OR-1 and OR-2 have presently a draft of 10 and 9.7m.In order to handle vessels with a draft of 12m the existing berths must be made suitable for such drafts. A possible solution is to construct a sheet pile wall in front of the existing structure and use the existing structure as anchor wall. In addition to the deeper draft the handling rates of the products needs be increased in order to increase the overall capacity. It is expected that two loading arms needs to be installed at the berth in order to achieve a loading rate of 800 ton /hour. The total annual capacity of the OR-1 and OR-2 will now be approximately 5 mil ton or products.
The total costs for the adjustments are estimated to be 60 Cr rp.

5.7.5 Adjustments of LPG-jetty

The LPG is currently used for only the import of LPG. The present loading rate will be increased to 800 1000 ton/hour, which will increase the capacity with about 1 million ton per year. As the LPG is for one client only, and the product will arrive in liner type operations, it is reasonable to accept higher utilisation levels than typically used for a single berth operation (60%). Furthermore, the time alongside the berth lost to paperwork and other administrative issues as well as cargo issues is also likely to much lower than at multi-user berths. Hence, the capacity of the berth is estimated to be around 4 Mt/year. The additional capacity can be used for either additional LPG or POL.

For the handling of POL several adjustments are required, such as additional loading arms, and pipes to the refinery. The total investments costs for these adjustments are estimated on 230 Mln Rs.

5.8 SBM facility for the handling of crude by VLCC

5.8.1 General description and motivation

Presently all crude import of about 7.5 million ton per year is handled at the Offshore Tanker Terminal (OSTT) resulting in berth occupancy of about 60%. This is considered the limitation of the berth, especially since the discharge rates are within the range comparing to other ports.

Space is limited in the outer harbour and solutions were sought in a development of a SBM outside the breakwaters. The SBM will be used predominately for the discharge of crude. It is expected that it can handle about 20 million ton of crude per year. This is based on the fact that VLCC has pump capacities up to 15,000 to 20,000 m^3 per hour.

A single point mooring consists of a single mooring buoy and capable of mooring crude tankers in adverse sea conditions.

5.8.2 Feasibility

The following remarks can be made:

- The investment was calculated by the VPT and is 540 Cr Rs.
- The additional throughput from the SBM is about 20-22 million ton of crude import per year, which is the capacity of the facility, depending on the ship's pump capacity and pipe lines to the refinery.
- The investment will be on the account for HPCL.
- Currently a discussion is ongoing between HPCL and VPT about the extension of the refinery, to which this project is linked. If the refinery is not constructed, the SBM may not be necessary. Still, HPCL is considering an SBM in any case as part of its policy to reduce transport costs and is thus switching to VLCC.

The discussion between VPT and HPCL has been concluded and the SBM will be installed within the jurisdiction of VPT. A renegotiated wharfage is part of the outcome.

5.8.3 Implementation

The project will be implemented via PSP. The following time frame is anticipated:

Action	Date or period
Negotiation of concession contract	Finalised November 2007
Start of Construction including design	March 2008
Start of Operations	January 2009

The investment for VPT is zero. The project could start in the beginning of 2009.

5.9 Entrance Channel and inner Basin

5.9.1 General description and motivation

The deepening of the entrance channel to the inner harbour and the inner harbour itself is one of the projects initiated by the VPT. The project is intended to be executed in three stages. The first stage involves the deepening to a draft of 11m and the final stage a draft of 14m. In the last stage the inner harbour should be suitable for Panamax vessels. However the entrance channel to the inner harbour is very narrow and curved and access with Panamax vessel should be carefully checked with nautical simulation. VPT has to take into account the slope protection measures while formulating the design of the entrance channel.

5.9.2 The financial and economic feasibility

The deepening of the entrance channel to the inner harbour and the basin in the inner harbour from 12.5m to 14 m draft is directed at accommodating Panamax vessels in the Inner Harbour.

On the basis of the traffic analysis, this investment is to be likely carried out for multiple clients. There is one client importing Coking Coal that would make use of this facility. The client has indicated that around 3 Mt of cargo will be offloaded in the Inner Harbour in the future, out of a 5.5 Mt package, 2.5 Mt is to be offloaded at the GCB. The only reason being that under present arrangements the GCB has insufficient capacity. At this point, no additional cargo is expected to arrive for this investment. The larger vessels will simply displace smaller vessels. In addition, no upsizing to Panamax is expected by other clients. The throughput related to the project is estimated at 3 Mt of Coking Coal. The estimate is based on a discussion with SAIL.

The total investment for the dredging has been estimated at 150 Crore Rs.:

Table 5-15 Investment deepening Inner Harbour / Entrance Channel to 14 m draft

	Cost USD (Million)	Cost Rs. Crore
Dredging	33	150
Total	**33**	**150**

The project will generate revenues from port dues, which are 11.5 Rs per GRT and from marine services such as pilotage/towage charges which are a lump sum of 20,000 Rs and 23 Rs per GRT.

The 70,000 DWT vessels are assumed to displace 50,000 DWT vessels. Parcel sizes will increase from 30,000 to 50,000 tons.

Table 5-16 Comparison of Current and New situation parameters, Million Rs.

	Current	New
Vessel size, DWT	50,000	70,000
Port dues per call, Million Rs.	0.23	0.32
Pilotage/towage per call	1.7	1.9

Maintenance cost on the civil works: 1.5% p.a.

Table 5-17 Summary table of financial feasibility

Item	Current situation	New situation	Incremental
Total operating Cost, Rs/tonne	0	7.5	7.5
Net income, Rs/tonne	63	27	-36
IRR, %		3.9%	<0%
NPV @ 8%, Crore Rs.	158	-40	-198

The project has a negative incremental IRR. The operating cost is around 7-8 Rs per ton for the new facility against around 0 Rs per ton in the current situation. The net income in the new situation is approximately 27 Rs/tonne and in the current situation these revenues are around 63 Rs/tonne. The Net Present Value of the new project alone is -40 Crore Rs when discounting at 8%.

Table 5-18 Details of the financial feasibility in the new situation, Crore Rs.

		Year									
		-2	-1	1	2	3	4	5	10	15	20
Throughput (Mt)	Coking Coal			3	3	3	3	3	3	3	3
	Incremental			3	3	3	3	3	3	3	3
Vessel calls	New			60	60	60	60	60	60	60	60
	Incremental			-40	-40	-40	-40	-40	-40	-40	-40
Revenues	Port dues			1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
	Pilotage/Towage			11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
	Total			13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4
Operating cost	R & M.			2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Depreciation				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Total cost				5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Net Income				8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
Capex		75.0	75.0								
Cash flow	New situation	-75.0	-75.0	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1
	Current situation			18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.8
	New-Old	-75.0	-75.0	-7.7	-7.7	-7.7	-7.7	-7.7	-7.7	-7.7	-7.7

Consultant’s recommendation

The project is generating an IRR of 3.9% on its own merits and compared with the current situation, the IRR turns negative. This project is not feasible on the basis of the projected throughput.

Space is freed up on the GCB. While this may be an appealing argument, the bottlenecks at the GCB can be resolved through mechanisation. The higher productivity obtained will offset the benefits of unloading in the Inner Harbour. If this solution is used, the main client of the deep draft would fall away.

It is recommended to deepen the inner harbour to a draft of only 12.5m in combination with the strengthening of the berths West Quays 1 through 4 and East quays 1 through 4. This draft allows bulk vessels up to about 60,000 DWT to enter the inner harbour, which is sufficient for the thermal coal vessels and fertilizer ships.

Deepening to 14m vessel draft should only be undertaken if a private operator is found willing to guarantee sufficient throughput to make the investment feasible, or when the expected cargo flow for the East Quays reaches sufficient mass. This is estimated to be as of around 6-8 Mt with Panamax vessels.

5.9.3 Implementation

The project is not expected to be required before 2015/16

5.10 Other infrastructural projects

5.10.1 Development of berth West Quay 5

Berth 5 is presently used for the export of alumina by a private operator and there seems no direct need for larger draft. In case the private operator wishes to receive large vessels, the berth can be upgraded, but a cost share agreement with the operator should be concluded.

5.10.2 Development of berth West Quay 6

The area between WQ 5 and 7 does not have a quay wall, but consist of a slope protection and is not suitable to moor vessels. The development of a quay wall at this location is a logical decision by the VPT to create fill in the gap between WQ 5 and 7. However the back land is very limited due the presence of the belt conveyor of the alumina export. This implies that the berth is only suitable for the import or export of bulk materials which can be transported by a conveyor belt. Granular products such as grain products could be handled here. The berth will be developed as a BOT contract.

The investment costs are Rs. 45 crore and will be implemented by the private operator.

Implementation

The project will be implemented via PSP and the tender will be brought on the market in the beginning of 2007. The following time frame is anticipated:

Action	Date or period
Proposal to the board	Late 2006
Permission of GoI	Late 2006
EoI for the project	Early 2007
Request for Proposals	Early 2007
Finalisation of Bids	Mid 2007
Award of the concession contract	Mid 2007
Start of Construction including design	Mid 2007
Start of Operations	Early 2008

5.10.3 Installation of mechanized facilities at WQ 7 for alumina export

A private investor is interested to use WQ 7 for the export of alumina, about 1 million ton per year. The investor and operator will supply the silos and conveyor belts to the quay as well as the shiploader. The operator will receive priority use for the berth and equipment.

Implementation

VPT will need to negotiate the terms with the operator, after which it is the operator's responsibility to implement and install the equipment.

5.10.4 Construction of EQ 10 and WQ8 in the inner harbour

According to the VPT, the development of berth EQ10 and WQ 8 are for the handling of respectively caustic soda and the export of alumina.

EQ10 is to be developed as a BOT, costing 35 Cr. Rs. The quay is to be operational by 2009. WQ8 will be developed by VPT, at a cost of 50 Cr. Rs and is expected to be operational by 2010.

Implementation

The EQ10 project will be implemented via PSP and the tender will be brought on the market in 2007. The following time frame is anticipated:

Action	Date or period EQ10	Date or period WQ8
Proposal to the board	Early 2007	Early 2008
Permission of GoI	Mid 2007	Mid 2008
EoI for the project	Late 2007	Late 2008
Request for Proposals	Late 2007	Late 2008
Finalisation of Bids	Early 2008	n.a.
Award of the concession contract	Mid 2008	n.a.
Start of Construction including design	Mid 2008	Mid 2009
Start of Operations	Mid 2009	Mid 2010

5.10.5 Development of Lova Garden Area

The Lova Garden Area, next to the Inner Channel may be developed in various ways. One of the proposals that has been put forward is a Ship dock facility. This would require dredging of the area. The project should only be considered if and when the entire investment, including infrastructure, is borne by a private investor.

5.10.6 Extension of the container terminal

The present container terminal is operated by a private operator, VCT and last year's throughput was about 40,000 TEU. The forecast is that this will grow to about 350,000 TEU in the year 2012.

The present capacity of the terminal is about 350,000 TEU per year. Additional crane capacity and yard equipment is required for this volume but the stacking area is sufficient to handle these container volumes. Adjacent to the existing container terminal, space is available for extension. The present operator, VCT has the first option to use this area for the extension. The investment cost is estimated at $42 million or Rs 210 Crore.

The terminal extension will be developed on a BOT basis, with first right of refusal for VCT to do so. VCT intends to use the space initially for bulk cargoes and smaller cargo flows, such as cars. When container traffic warrants development of the area into a container terminal, the company can do so.

Implementation

The project will be implemented via PSP. The project will require (re)negotiations with the current operator and it is emphasised that the project should be developed quickly in order to develop cargo flows that may as yet be small and have capacity for container traffic if the client is able to capture envisaged flows. The following time frame is anticipated:

Action	Date or period
Proposal to the board	2007
Permission of GoI	2007
Renegotiation of contract	2007
Start of Construction including design	2008/09
Start of Operations	2009/10

5.10.7 Development of Fishing Harbour

The Fishing Harbour may over time be developed into stacking area for the Container Terminal, with space for a Container Freight Station, as well as create additional berths for smaller container feeder vessels. The project is not foreseen to be implemented during the current Business Plan period. The total cost of the project is estimated at 100 Cr. Rs.

5.11 Marine services

In general it can be stated that the capacity for the marine services in term of pilots and tug boats is sufficient for the present ships calling at the Port. For the handling of Cape size vessels the following investments would be necessary:

- To enable night berthing it is recommended to purchase a tug boat of 75 tons bollard pull and to widen the entrances channel near the harbour mouth
- In case VLCC will be handled at the SBM, NOM facility and probably also for the OSTT at least two tugboats of 75 tons bollard pull will be required.

In view of the above it is proposed to purchase a 75 tons tug boat and one more in case the VLCC's will be handled at the SBM.

Moreover two tug boats have to be replaced due the fact that the life of the tug is estimated at 20 years. The replacement of the two tug boats of 30 tons each can be implemented in 2010 and the second one in 2012.

5.12 Confrontation of supply and demand

The projects listed above account for well over 70 Mt of capacity. Part of this is replacement of existing capacity, as mechanisation is undertaken. Some projects have relatively short lead times and consultants advise that these should be undertaken as soon as possible to relieve the congestion. The other projects require lead times due to the necessity of further detailed analysis and the simple reason that substantial construction is to be undertaken. The business plan period can be used to initiate discussions with users, undertake thorough market research and start planning accordingly. In any case, for projects that are clearly single-user, discussions should be held with clients to obtain commitments of cargo or direct investment. For multi-user berths, independent terminal operators may be attracted.

Table 5-19 Summary of projects

Project	Capacity Mt	Cost Crore Rs.	Consultant's recommendation
Export facility for Thermal Coal WQ1/WQ2	3-6	117	Viable project
Import facility Granular fertiliser EQ1-3	4-10	77	Viable project
Mechanisation General Cargo Berth	11	237	Viable project, under development
Deep Water Dry Bulk terminal	16	385	Rejected
Deepening Inner harbour to 14m draft	3*	150	Not viable
200k Dwt vessels Iron Ore Jetty	3.5*	50	Under development
POL jetty		113	Rejected
Relocation Oil mooring		30	Under development
SBM facility	15	540	Under development
Relocation of container terminal		99	Rejected
East Docks development	8.5	207	Viable project
Replacement equipment Iron Ore Handling complex and remaining costs on upgrading complex		203	Under development
Extension Container Terminal	4	120	Under consideration
Total main projects not rejected		1834	
Total other waterside related projects		551	
Grand total		2385	

Note: * capacity based on targeted cargo.

After the projects have been implemented, the total available capacity of the port will rise to 110-120 Mt per year. The emphasis is on enabling and facilitating bulk cargo handling and mechanising the existing facilities. Almost all cargoes will have sufficient residual capacity to cover demand well after 2012-13. For certain cargoes, some planning may be required during the business plan period. However, it should be noted that the capacity by commodity is not a full one-on-one relationship with berths. Handling on different berths will allow cargoes to be traded through VPT.

The investment projects might affect the handling of general cargo and project cargo, e.g on EQ 5 and 7. due to BOT contracts for fertilizers. Due to implementation of the proposed investments, berth space will become available on WQ 3-4, which can be used to handle this cargo. The cargo can also be handled on EQ 1-3, as long as the new berths are not refurbished, deepened and given out via a BOT to a private operator.

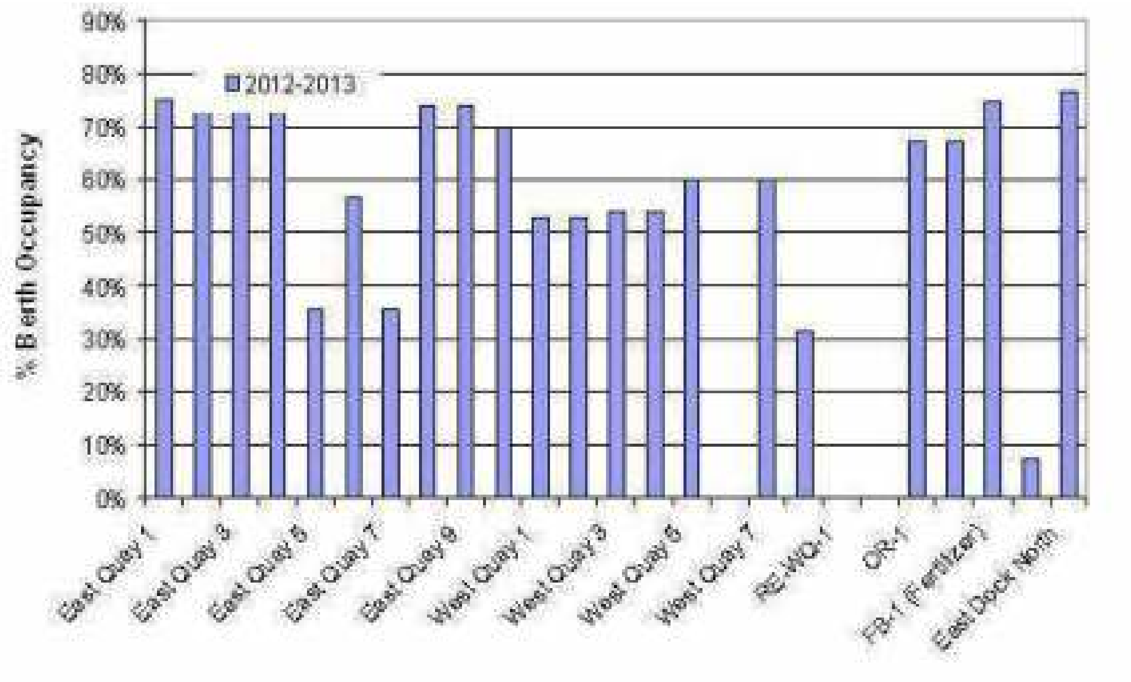
Table 5-20 Future throughput and capacity after implementation of projects, 2012-13, Mt

	Expected throughput 2012-13	Available capacity
Iron Ore (fines)	23	23
Steel & Pig Iron	1	1
Thermal Coal	3	5
Alumina	7	8
Calcined Coke	1	1
Other Dry Bulk*	2	2
Other General Cargo	2	2
POL	5	5
Containers	2	4
Fertilizers	2	2
Fertilizers	3	7
Food Grains	1	1
Coking Coal	11	16
Other Dry Bulk	0	3
Other General Cargo	1	1
Crude	16	25
POL	2	2
LPG	4	4
Other Liquids*	2	5
Containers	2	4
Transhipment		
Total	89	119

Note: *Covered on various berths

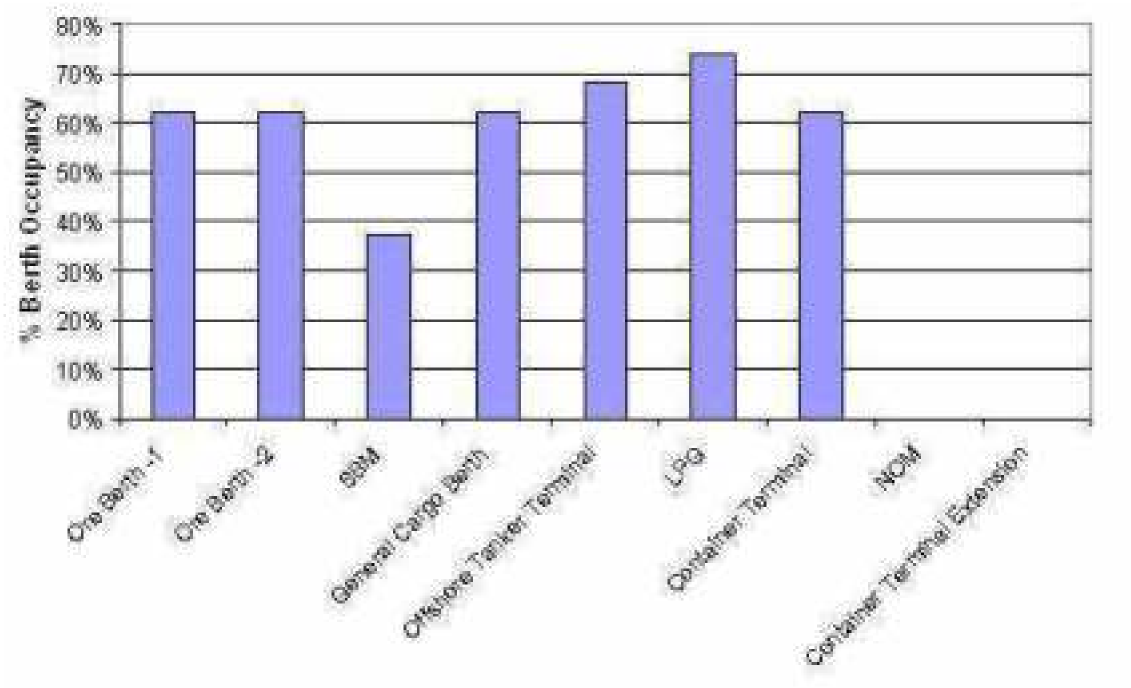
For the Inner Harbour, throughput remains at fairly low utilisation levels on the East Quays. The West Quays will still have capacity to accommodate growth after the planning period. Fertilisers might require solutions towards the end of the planning period. Yet, for the Inner Harbour, the implementation of the projects will make the congestion experienced a thing of the past.

Figure 5-1 Berth occupancy in 2012-13, new configuration, Inner Harbour

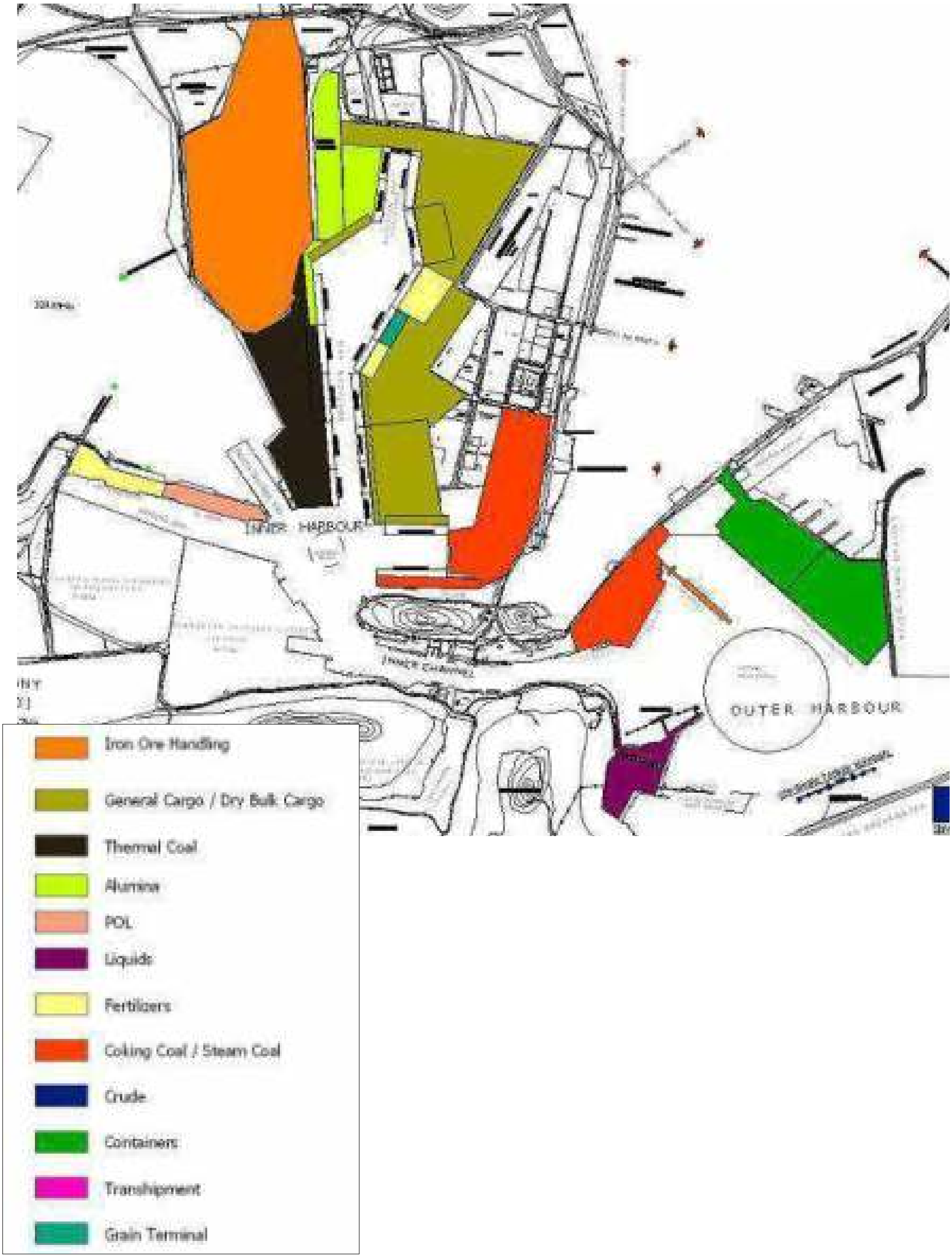


The projects carried out in the Outer Harbour (and outside the breakwaters in case of the SBM) will also significantly reduce occupancy levels. Waiting times will be near non-existent for the dry bulk related terminals.

Figure 5-2 Berth Occupancy in 2012-13, new configuration, Outer Harbour



Map 5-4 New port lay-out



5.13 Long term developments

The present capacity of the port is about 55 Mt. After implementation of the projects as described before the total capacity of the Port of Visakhapatnam comes around 120 Mt, which will be sufficient for the coming 15 years. This implies that the Port will reach its full capacity around 2020.

For the period thereafter 3 options remain:

- Consolidation of the Port activities;
- Extension of the port activities by creating a new outer harbour;
- Capacity extension by creating a second inner harbour.

From an economic point of view for the further extension of the ports capacity an evaluation has to be made of investing in a new outer harbour or creating a second inner harbour. The picture below presents the contours of a new outer harbour (in orange) and of a second inner harbour (in yellow).

Map 5-5

The investment components for investing in a new outer harbour consist of:

- The construction of breakwaters at a water depth of about 20 m;
- The reclamation of the land with a volume of about 20 million m3;
- Dredging works with a volume of about 6.5 million m3; and
- The construction of quays at a water depth of about 16 m.

At present, the Navy has its base in the inner port between the western and northern arm. This means that a solution needs to be found in the relocation of the Navy. The costs associated with this may include the cost of relocation itself, part payment of new facilities and a fee to vacate the area. The investment components for creating a new inner harbour consist then of:

- Relocation of the Navy;
- Widening of the inner channel in order to make suitable for 2 way traffic; and
- Deepening the inner channel and the basin to a depth suitable for Panamax vessels.

The results of a very rough calculation suggests that the investment cost of a Inner Harbour (about US$ 150 million) is substantially lower than expansion of the Outer Harbour (about US$ 650). The consultant emphasizes that these cost figures are based on very rough estimates for unit costs as well as for sizes/volumes; uncertainties and associated margins have to be taken into account.

In addition, not only the direct investment costs need to be compared. User costs and benefits need to be taken into account as well. The difference in the distance between the two locations and the end users is estimated at about 20km. That is, the Inner Harbour has an advantage in distance of 20km each way a truck or train needs to cover. On the average the costs per tonkm is about 5 to 10 USD cents. Assuming that 50 million tonnes of cargo are transported, the saving in the annual transportation costs will come to 25 upto 50 mln USD per annum. These annual savings occur by expanding the Inner Harbour versus the Outer Harbour.

As such, it is highly unlikely that expansion of the Outer Harbour can ever be justified on economic arguments as long as the Navy might be persuaded to vacate the area.

Furthermore, the surface area of the Inner Harbour is large. In the set up of a Land Lord port, it is primordial that the port has access to land and waterside, so that demand can be accommodated as and when it arises. The port does not need to develop associated quays at once, but must be capable of offering the possibility at a later stage.

6. LAND USE PLAN

6.1 Land use planning approach for VPT

The land use planning covered in this study aims towards strategic land use planning in line with the Business Plan and its implementation by the Vishakhapatnam Port Trust (VPT). The consultants analysed the existing land use of VPT and identified the key land use changes that are likely to take place due to implementation of the Business Plan. Based on this the preliminary land use plan has been formulated. One of the key drivers of the Land Use Plan is to ensure that port has adequate land and associated infrastructure available to meet the forecasted trade growth in future.

The proposed land use plan essentially involves identification and demarcation of land depending upon future growth of the port its implication on the city's growth. This would result in a preliminary land use plan based on the business requirements.

Consultants have prepared the preliminary land use plan keeping in mind the following aspects:

- Understanding the business activities in the port area – existing and / proposed in future
- Environmental issues of the port – existing and may arise in future

Consultants attempted to cover the following details as a part of preliminary land use plan:

- Stack yards for the future stacking requirement for the port
- Parking and truck terminal requirement
- Propose land spaces at appropriate places for ancillary requirements
- Propose buffer zones in the port considering the environment aspect
- Land use changes based on the business plan project proposals

6.2 Existing land use of VPT

The port of Visakhapatnam has a huge land area admeasuring 4368 ha. The table below provides the distribution of this land according to its existing use.

Table 6-1 Details of the major break up of Port land and Land Use of VPT

Land use	Hectares (Ha)	Percentage
Land alienated to defence	1345	30.8
Land leased for port based industries	1128	25.8
Waterways of inner harbour	101	2.3
Land occupied by hills and nallas	441	10.1
Land for residential purpose	80	1.8
Land for recreational complex	26	0.6
Land for port's operational buildings	20	0.5
Land for port's operational areas (docks, road, rail lines, stacking area, OHC)	716	16.4
Land leased for warehouses	87	2.0
Land proposed for lease to establish warehouses/CFS	60	1.4

Land use	Hectares (Ha)	Percentage
Land for long term lease for cargo related activities and bulk storages	324	7.4
Land for green belts	40	0.9
Total land owned by VPT	4368	100

The existing land use has limited land for operational activities. It can be seen from the table that about one third (30.8%) of the land is alienated for the defence related activities. Nearly one fourth (25.8 %) of the land is leased for port based industries. Substantial portion of the land is occupied by hills and nallas which pose problems for development. The land dedicated for the port's core operations such as docks, stacking area, OHC, roads, rail system is about 716 ha (16.4%) with green belts occupying slightly less than one percent of the land.

The residential area around the old town adjacent to the outer harbour of the port is a major hindrance to the expansion plans of the port. The movement of cargo from and to the outer harbour has to be through a long route circumventing a hillock to avoid movement of heavy vehicles through the city. One of the major problems faced by the residents of the areas close to the port is of pollution due to handling of coal/iron ore etc. In order to mitigate the air pollution, the port has taken several measures such as installation of sprinklers and providing a green belt all around the port premises.

6.3 Land development strategy

VPT handled about 56 Mt of cargo in the year 2005-06. It is expected that this traffic is likely to grow to about 87.5 Mt by 2012-13. Keeping this increase in cargo in mind it becomes important for the port to make necessary provisions to make the land available for the essential uses such as storage, roads, rails, sidings etc.

Considering these facts, it is recommended that VPT can consider following strategies for land development in order to meet the port's future needs.

- ***Acquiring the land adjacent to the port***
  It involves acquisition of the land after relocation of the existing buildings structures. Suitable land areas around the port can be identified and explored for acquisition. Consultants have attempted to identify such locations based on site observations and discussion with the port officials and described in the land use plan proposals.

- ***Changing the existing land use within port area***
  There are a lot of opportunities in terms of land use changes in the port area; for example, east yard dump and area adjacent to the east quays can become future operational and transit zone for the port and could solve the future stacking and transit requirements, thus enhancing the port business. Underutilised land could be used for new uses. It is understood that about 581.5 Ha of land is available with VPT which is designated for different schemes such as establishing warehouses, CFS, storage etc.

- ***De-leasing the existing land given on lease***
  VPT has leased about 1170 Ha of land to various parties for port based industries. As a part of development of ware houses phase – I the land is already allotted to various parties (RCL,

Prathusha, CWCL etc.). Consultants propose that VPT to have a constant check on the land leased and its use by the lessee and should try to find out the land pieces which are un/under utilised so that they can be de-leased if found necessary.

6.4 Proposed preliminary land use plan

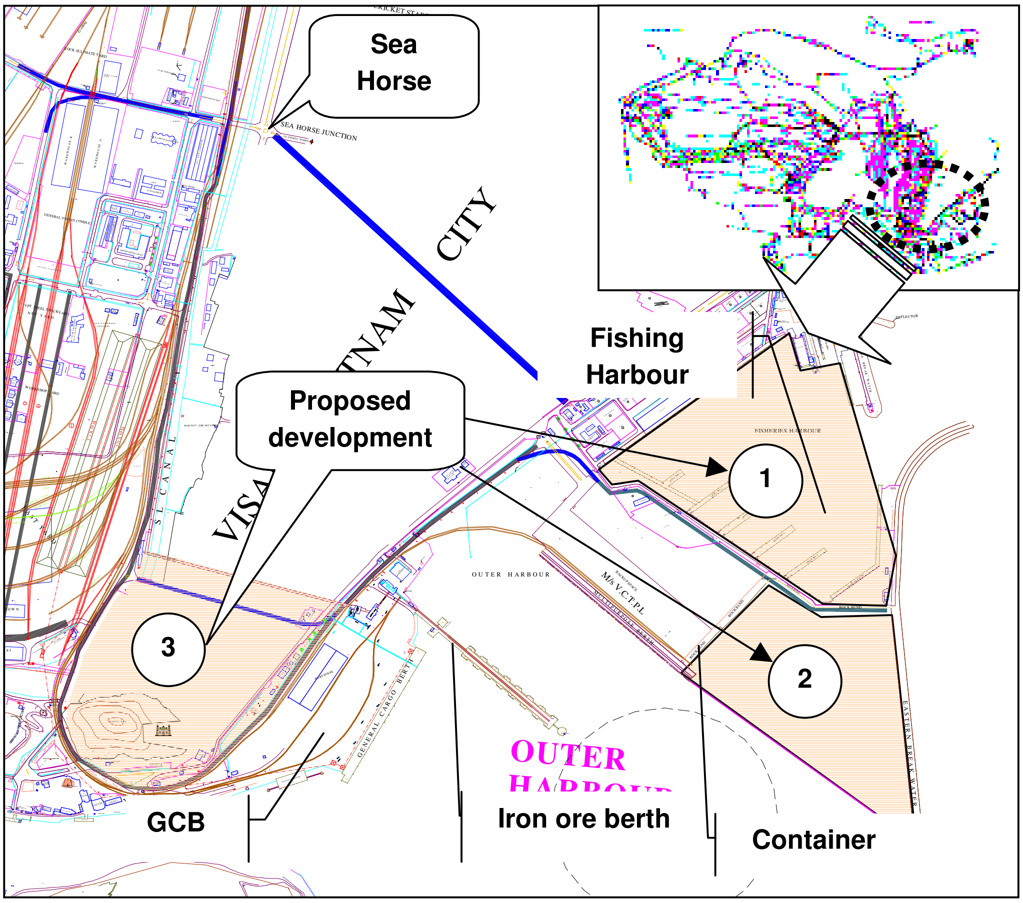
Major draft proposals which have been proposed and discussed with stake holders are as follows:

6.4.1 Acquisition and development of the land

VPT is facing land scarcity for future stacking and other requirements. For this, VPT would need to find out ways such as to redevelop existing area or acquire the adjacent land area. For this purpose, VPT should do following:

- identify suitable areas available for acquisition around the port area.
- carry out feasibility for acquisition covering area of land to be acquired, cost of the land, legal requirements, etc.
- find out if these areas are populated and population density
- if people reside, VPT should conduct detailed rehabilitation and relocation study for project affected persons (PAP) as per the multilateral funding agency guidelines

Map 6-1 Land use change proposal at Outer Harbour area



Proposed development 1:

The existing fishing harbour area (as shown in Map 6-1 as shaded area 1) admeasuring about 38 ha is presently being used by local fishermen for fishing related activities and as shelter for their launches/crafts. Development of fishing harbour area is proposed for creating additional stack yards, storage sheds, CFS, etc. For this the existing fishing harbour is required to be shifted to Bhimli located along the coast at a distance of about 20 km from Visakhapatnam. It is understood that the state government has agreed to provide the land (land-to-land exchange for Airport expansion) at Bhimli, which can be used for this relocation.

Proposed development 2:

This is related to the extension of the existing container terminal (as shown in Map 6-1 as shaded area 2). This will make available an area of about 16 ha which would be used as back space for the extended berth.

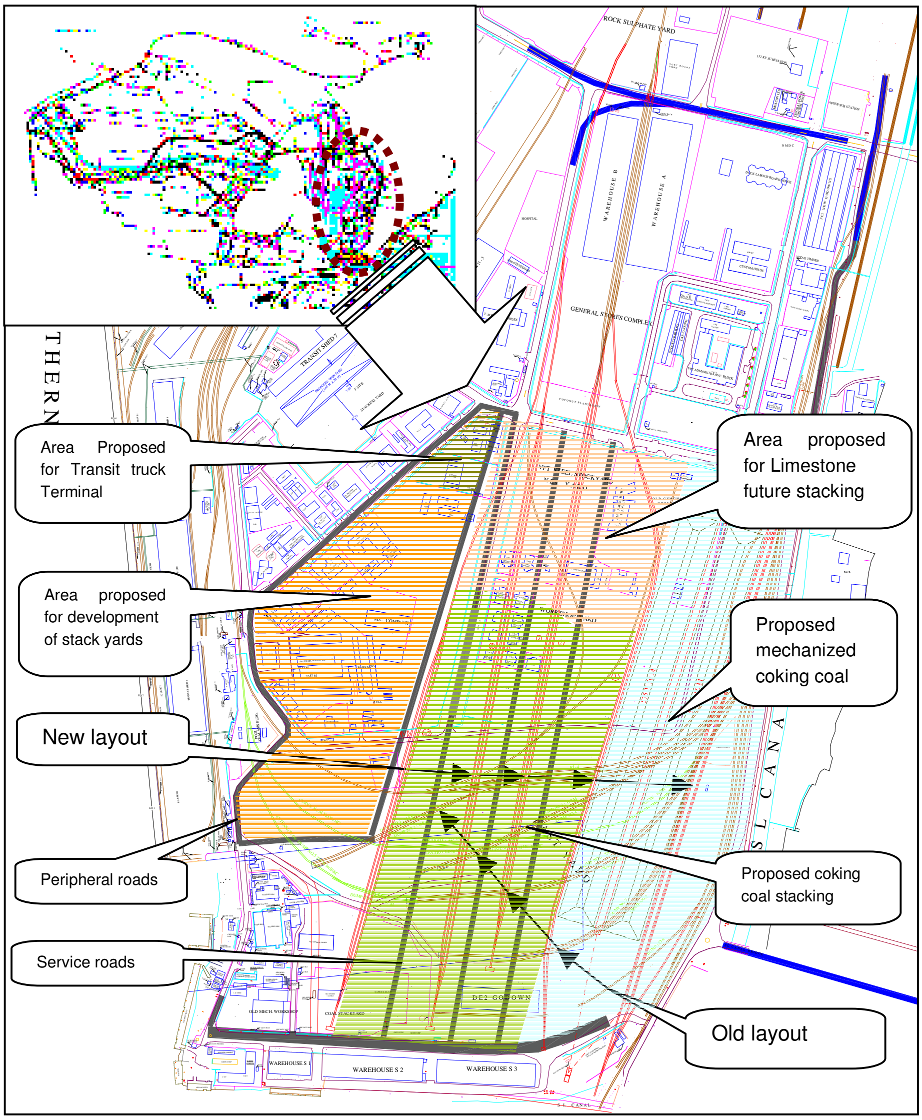
Proposed development 3:

During the workshop (draft final stage), it was discussed that VPT can explore the idea of acquiring the area as shown in Map 6-1 as shaded area 3. This area is about 14 ha and can be used for various purposes such as transit and permanent storage sheds. Further the flyover road (Option 2 as discussed in section 7.3.1 – outer harbour connectivity of this report) may also be possible if this area is acquired by VPT. This may also help reducing the environmental pollution problem due to coal handling as the human settlement will be relocated away from the port area.

Consultants suggest that these land areas should not be used for handling commodities like coal or iron ore and preferably should be used for developing warehouses and stack yards/storage sheds etc. which will not give rise to environmental problems for the city.

6.4.2 Development of area adjacent of the east quays after relocation of existing structure

Map 6-2 Land use change proposal at Inner harbour area



Consultants propose the land use change as depicted in the above figure. It is also related to the East Yard Revamping and GCB Mechanisation project which will bring in the restructuring of existing railway track layout and associated activities like stacking/handling/loading etc.

Consultants propose to demolish the existing structures and use the land recovered (adjacent to the east quays) for development of the stack yards and storage spaces which could solve the future stacking and transit problems for the port operations. This would make available about 9.8 Ha of land. Consultants also suggest widening of the existing road and internal service roads all around which could cater to the road based traffic. The existing building structures in this area could be relocated in the multi-storied tower building near the Convent junction (as explained in the next proposal). It is also proposed to have a provision for transit truck terminal in this area with basic repair and servicing facilities for the trucks.

6.4.3 Proposal of a multi-storied administrative cum commercial building

This proposal is related to the above land area development adjacent of the east quays after relocation of the existing structures. The figure below shows the proposed relocation.

Map 6-3

The identified suitable site for relocation is near Port/Convent Junction. Total area to be dismantled is about 3.5 ha which needs to be made available at this relocation site with suitable permissible Floor Space Index (FSI). The existing establishments could be accommodated in multi-storied tower buildings in this area.

Table 6-2 Block cost for development of area adjacent of the east quays after relocation of existing structure and proposal for multi-storied building

S.NO.	DESCRIPTION	AREA	LENGTH/ QTY.	UNIT	RATE IN RUPEES	COST IN CRORES
A.	Development of additional stack areas by demolishing of the existing structures	9.5		hectare		
a.	Site development with old demolition	95000.0		sq.mt.	Rs1,500	Rs23.75000
b.	Provision for peripheral arterial road along operational areas		4000.0	mt.	Rs40,000	Rs16.00000
c.	Provision of service roads		3000.0	mt.	Rs20,000	Rs6.00000
d.	Provision for transit truck terminal	20000.0		sq.mt.	Rs8,000	Rs16.00000
e.	Relocation of existing structures near convent Junction	3.5		hectare		
f.	Flyover for outer harbour connectivity		1000.0	mt.	Rs90,000	Rs9.00000
g.	Stack Yards and Storage Sheds	30000.0		sq.mt.	Rs1,700	Rs5.10000
h	Demolition and debris disposal away from site	35000.0		sq.mt.	Rs4,500	Rs15.75000
	Road widening from VPT boundary till truck terminal		5000.0	mt.	Rs30,000	Rs15.00000
B.	Multi-storied administrative cum commercial building proposed near Port/ Convent junction	8.0		hectare		
	Site development	80000.0		sq.mt.	Rs2,200	Rs17.60000
a.	Super structure with other services and interiors, etc.	35000.0		sq.mt.	Rs11,500	Rs40.25000
1)	Electrical installations					Rs17.08000
2)	Water supply					Rs6.83300
3)	Contingences					Rs10.25000
4)	Drains					Rs6.83300
5)	Environmental measures					Rs10.25000
						Rs215.69600

6.4.4 Truck terminal

At present about 200 to 300 tankers have to park along the roadside due to lack of basic parking facilities. As the cargo throughput increases; the road bound traffic is bound to increase which in turn will generate more truck trips and their parking requirements.

The current commodity wise export /import cargo received /dispatched by road for various years is listed below which is used to estimate the number of trucks that would require parking in truck terminal.

Table 6-3 Annual cargo traffic received/despatched by road

Cargo volume	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2012-13
Import (tonnes)	3462984	4005670	2448664	1175500	1324752	1047899	1108848	13809107	
Export (tones)	91283	71835	137771	270287	433351	497254	4390087	2609149	
Average daily traffic (ADT)									
Average payload per truck	10	tonnes							
No of working days per year	330	days							
In terms of truck trips									
Import	1049	1214	742	356	401	318	336	4185	
Export	28	22	42	82	131	151	1330	791	
Total	1077	1236	784	438	533	468	1666	4975	
Assuming that each truck trip has a half trip (empty move) associated with it									
Trucks /day (both directions)	1616	1853	1176	657	799	702	2500	7463	10663

Figures for 2012-13 are forecasted by assuming growth rate of 5.23%
(rate of growth as per traffic forecast for 2005-6 to 2012-13

6.4.5 Area requirement for Truck terminal

Based on the assumptions of the existing road traffic and number of trucks requiring halt in the port area per day and considering the future requirement; it is assumed that about 750 trucks will require parking facility per day. Truck repair and servicing facilities within the terminal will also have to be provided.

Assumptions for estimating the area required for truck terminal

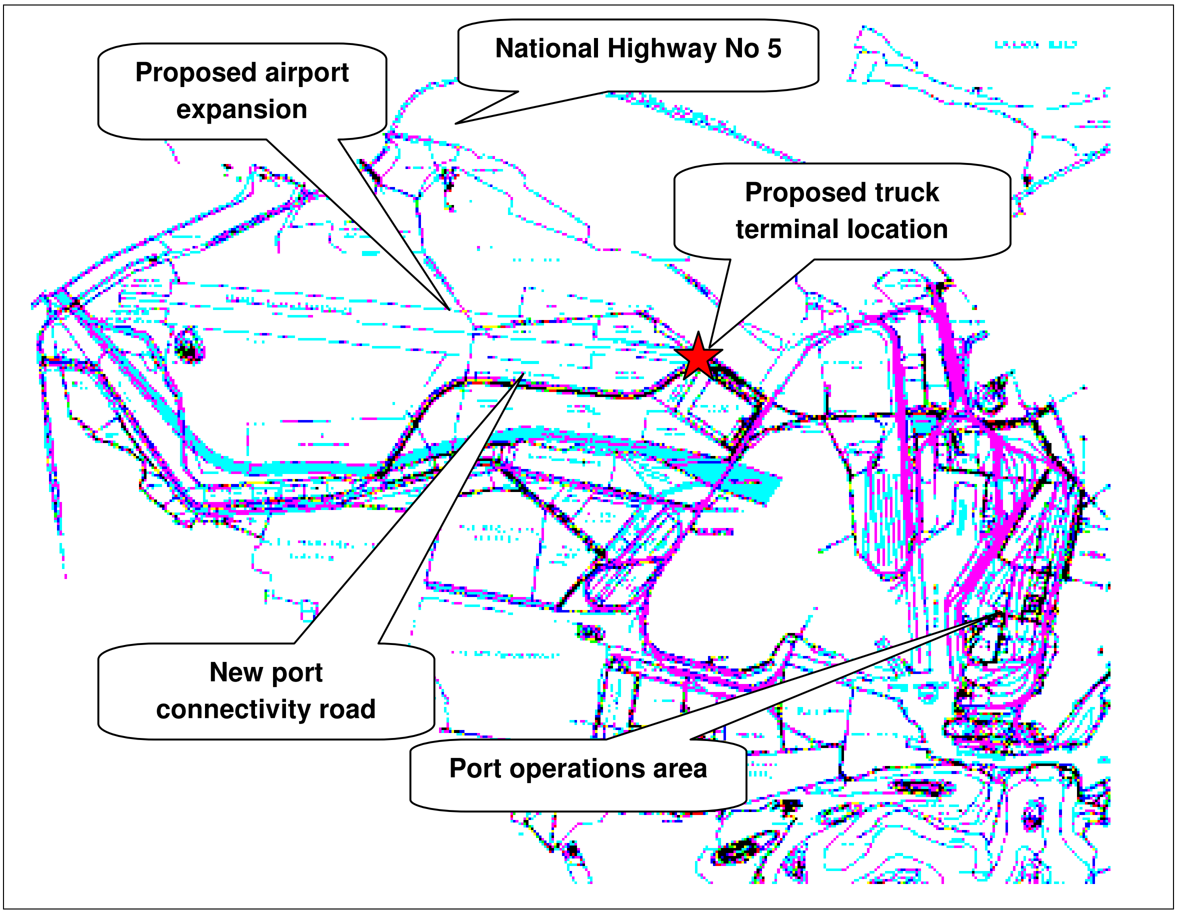
Parking area required per truck	50 sq. m.
Service area	500 sq. m.
Staying facilities for truck drivers	300 sq. m.

As per the assumptions made above, approximately about 3.8 Ha of land area will be required for the proposed truck terminal.

6.4.6 Location for the truck terminal

Considering port traffic and from consultant's preliminary assessment based on site visit, the suitable location for the proposed truck terminal is identified in the north east corner of the proposed airport expansion as shown in figure. This will help to discourage traffic through the city roads and help in maintain good city environment with less traffic congestions.

Map 6-4 Proposed truck terminal location



6.4.7 Provision of buffer zones

Consultants propose provision buffer zones of plantation between the east yard dump area where coal, limestone and fertilizers are going to be handled and the adjoining city area (as shown in the figure below). This is very important from the environment point of view considering the proximity of the city to the port.

Consultants also suggest that the trees that would have to be removed during the relocation and new development in the east yard dump area; can be transplanted and reused in these zones.

Map 6-5 Buffer zone Proposals

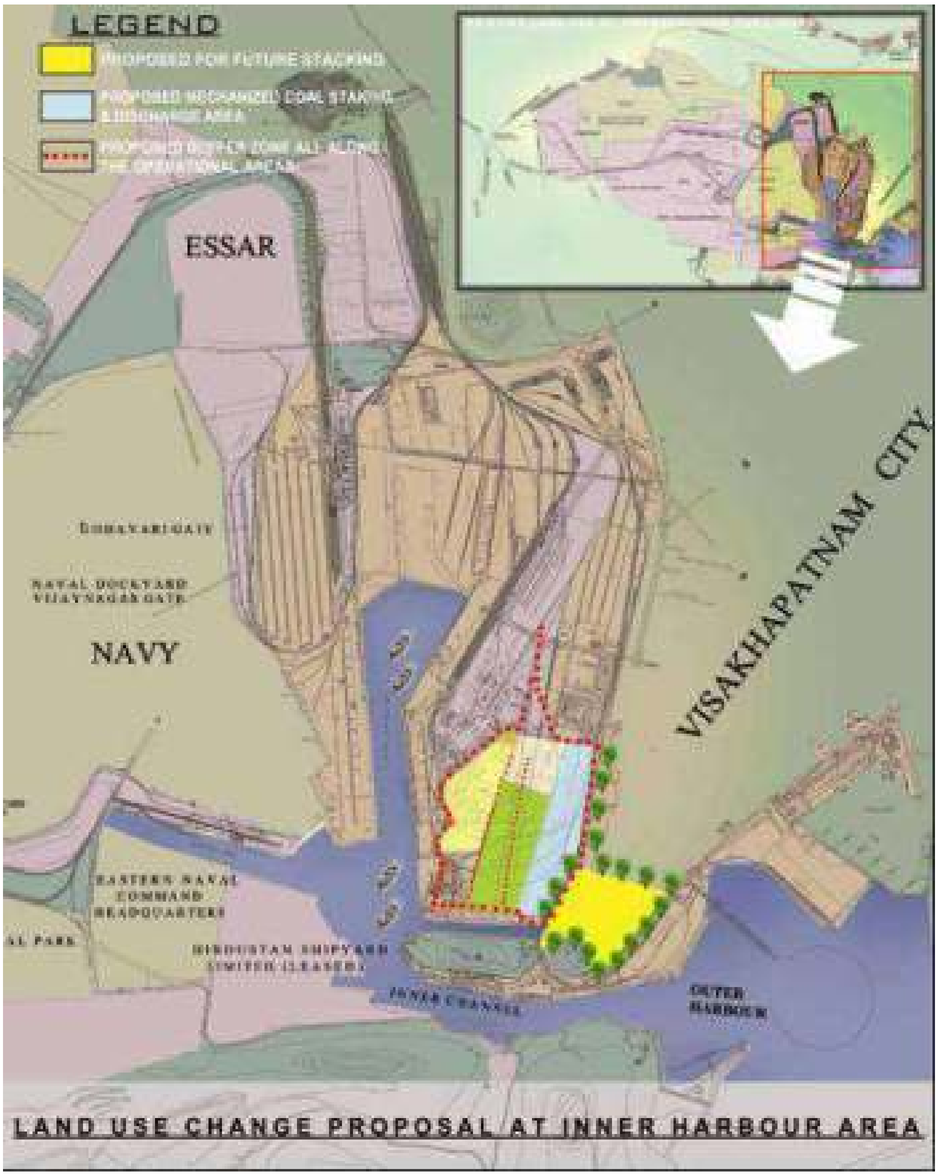


Table 6-4 Block cost for Buffer zone proposal

S.NO.	DESCRIPTION	AREA	LENGTH/ QTY.	UNIT	RATE IN RUPEES	COST IN CRORES
	Development of Buffer zone proposed near the major operation area in the east yard dump as well as near the proposed acquisition area near the outer harbour.	18.5		hectare		
a	Planting and Transplanting of the trees		4500.0	nos.	Rs10,000	Rs4.50000

6.4.8 Summary and conclusions

Title	Key Features	Project Cost
Preparation of detailed master plan for port area for 20 years perspective	Identify existing land-use zones and future land-use zones Implementation plan for the same Continuous monitoring and review for the same	Preparation of master plan = 1 crore
Identification of suitable areas for future stacking areas and connectivity between inner harbour and outer harbour	identify suitable areas available for acquisition around the port area Carry out feasibility for acquisition covering area of land to be acquired, land-holding details, cost of the land, legal requirements, etc. find out if these areas are populated and population density if people reside, VPT should conduct detailed rehabilitation and relocation study for project affected persons (PAP) as per the multilateral funding agency guidelines	For feasibility study and R & R study = 1 crore
Revamping of East yard dump area – development of stack yards	Development of additional stack areas by demolishing of the existing structures Additional area available for stacking and ancillary activities = 9.5 ha Provision for peripheral arterial road along operational areas Provision of service roads Provision for transit truck terminal Relocation of existing structures near convent Junction (area requirement = 3.5 ha built up)	Development of stack yards = 215.69 crore (after demolishing, relocation and site development) Roads (about 4 km peripheral road with 3 km service roads) = 15 crore
Truck terminal	Location –North east corner of Airport Expansion. Area requirement = 3.8 ha Proposed capacity 750 trucks per day Provision of facilities such as parking, staying, repair, fuelling etc.	To be developed by Public Sector Privatization (PSP)
Development of Buffer zone	Location – near the major operation area in the east yard dump as well as near the proposed acquisition area near the outer harbour. Area available = 18.5 ha Development of additional stack areas by demolishing of the existing structures	4500 trees (considered to be planted including transplantation and maintenance) = 4.5 crore

Consultants recommend that VPT should formulate a detailed land use master plan with 20 years perspective which would have all the proposals included in the business plan and their phasing. It is also recommended to monitor and review land use plan every two years.

6.5 Existing storage and future storage requirements

Existing storage area berth wise is studied in detail by the consultants and based on the future traffic projections and new berth wise dispatch of the goods we have proposed storage areas and their location of which details we have included in the individual land use proposals above. The storage details includes open and close storages where container, iron ore and coal are majorly open storage commodities and fertilizers, general cargo and POL are closed storage commodities.

Table 6-5 Details of Storage area existing/proposed

Commodity	Berth	Existing traffic in Ports 2003/04(Mt)	Projected traffic 2012/13(Mt)	Existing Location of storage area	Proposed Location of storage area	Existing storage area(Ha)	Proposed storage area (Ha)
POL	OR1 & 2, OSTT, NOM, LPG	16.9	23.9	Tanks within HPCL, IOCL	Proposed extension of HPCL area and the proposed SBM.	170	161.84
Container (TEU	Container berth	0.6	4.0	Container yard along container berth.	Extension of container berth.	13.4	16
Iron Ore	OB 1 & 2 (mech),WQ (Conv)	15.95	23.0	Ore stack yards, NMDC stack yards.	Ore stack yards, NMDC stack yards.	15.24	15.24
Coal(coking coal imports, thermal coal and steam coal)	GCB, WQ 1 to 5	11.8	11.8	Alongside WQ berths, GCB, East yard.	After east yard revamping, area will increase for coal storage	42.94	45.03
Other Cargo(Fertilizers, fertilizer raw materials, general cargo and dry bulk)	WQ 1 to 4, WQ 5, EQ1 TO 7	9.8	22.4	NALCO lead storage, SAIL lead storage, Food grain - FCI godowns Soya extracts-Tinna Sheds.	Proposed storage areas for fertilizer near the East yard revamp area and near to berth WQ 1 to WQ 4.	62.8	23.17

6.6 Land use plan implementation monitoring and review

6.6.1 Land Use Plan Adoption, Review and Stakeholders Involvement

Every second year, the VPT should prepare an informal Report Card that will comment on how the Plan has served it during the past two years, and recommend any appropriate changes, amendments or elaborations. The Report Cards will be posted on the VPT's web site, and should be made available to the public at a bi-annual Community Open House to be hosted by the VPT. The Open House will provide members of the public with an ongoing opportunity to provide their feedback and indicate any concerns regarding Port activities. At the same time, the VPT will continue to actively encourage open communication with concerned stakeholders on an as-needed basis.

The VPT should formally review and update the Land Use Plan every 3 years, or earlier in the event of a significant, unanticipated change in direction. The seven-year plan review process will involve active dialogue with the Vishakhapatnam City and community stakeholders. Future versions of the Land Use Plan should be made available on the VPT's website, and made available at the Open House scheduled for the year in which the updated Plan is produced.

6.6.2 Building Review Process

As a Central Government agency, the VPT must ensure that all buildings and structures comply with the standards of the National Building Code. Construction of new buildings/structures or renovation of existing buildings/structures on lands owned by the VPT will continue to be reviewed by VPT staff, to ensure compliance with the Code. Records relating to building construction and Code compliance review will be maintained by VPT staff.

6.6.3 Environmental Review Process

As a Central Government agency, the VPT must meet the requirements of the Various Environment Act, and other applicable environmental policies and guidelines for both the land and water it owns and occupies. VPT will expect a high standard of environmental controls from its tenants, and intends to comply with applicable Central and State environmental legislation. It will cooperate and consult with environmental agencies, including State and Central Pollution Control Board, State Fisheries Department, State and Central Ministry of Environment and local conservation authorities, when deemed appropriate or necessary.

6.6.4 Intergovernmental Relationships

Lands owned by the VPT are located primarily within the Vishakhapatnam City. The VPT has worked hard to build positive working relationships with both Municipal Corporation of Vishakhapatnam and Vishakhapatnam Urban Development Authority, and intends to actively maintain and foster these over time. Many other situations may arise which demand VPT collaboration with either the Central or State Government. VPT recognizes the value of continuing to work in concert with all levels of government, and as such, it will maintain an open planning process, and will consult with and inform the Cities, the Central and State governments, and its neighbours regarding significant future developments/changes in use, particularly where there are clear stakeholder concerns and/or areas of mutual interest.

6.6.5 Municipal Planning Provisions

The Master Plan and zoning provisions currently applicable to the lands owned by the VPT and it have environ is under the jurisdiction of both the City of Vishakhapatnam and are supportive of port activities and requirements. Vizag is going to be developed as an industrial, tourism and institutional city as per the Master Plan of Vishakhapatnam, which is under processing. There for it is important to ensure that no changes are required to the provisions applicable to lands owned by the VPT; nor are there any issues or conflicts related to zoning on adjacent properties. The VPT will continue to work with the City to ensure that potential future zoning/Official Plan changes remain supportive of port-related activities and industrial uses. As per the requirement development in the vicinity of the port requires sanction from Vishakhapatnam Urban Development Authority.

7. CONNECTIVITY PROJECTS

7.1 Road infrastructure

The following sections present the transport requirements related to road traffic movement and list the projects that can help in meeting these requirements. The cost and timelines for the identified projects are taken from the VPT project database wherever applicable and for the newly proposed projects block cost estimates[1] are made based on the previous experience and discussions with VPT officials. Further these projects were discussed in detail during the Draft Plan Presentation and revised based on the feedback received.

The alignment design and estimated costs proposed are indicative in nature and hence a detailed Technical Feasibility Study needs to be conducted before taking up for the implementation. All the proposals mentioned in this chapter need to be analyzed thoroughly from traffic point of view before finalising in view of fluctuating requirements of trade so that it is ensured that only best fit option is implemented.

7.1.1 Port connectivity with National Highway and associated projects

Based on the recommendations from The Planning Commission, Government of India; the National Highway Authority of India (NHAI), has taken up the development of roads for connecting the major ports in India with the nearest national highway grid. The Port Connectivity Road (PCR) connecting Visakhapatnam Port with the National Highway – 5 is developed under this scheme. The project stretch comprises of a total of 12.47 km connecting the Convent Junction (to NH-5 (near Ayyappan temple) with about 4.87 km of flyovers and ramps. 'This Port connectivity road to NH5 is completed and opened for traffic with effect from 15-12-2006. This project has been completed successfully through a Special Purpose Company (formed by VPT and NHAI.) called Visakhapatnam Port Road Company Limited, which is responsible for operation and maintenance of the project. It is proposed to install two toll gates on the connectivity road. The toll revenue generated will be used to service the debt and maintenance of the road.

[1] Assumptions for calculating block cost estimates for road/rail projects

Sr. No.	Item	Cost in Crore Rs. / km
1	Construction of flyover road (2 lane)	15
2	Construction of road with embankment (2 lane)	5
3	Construction of road without embankment (2 lane)	3
4	Widening (2 to 4 lane) with strengthening of road	3
5	Construction of a bridge (2 lane) across river (@ 300m span)	9

For calculating cost of 4 lane facility the above rates are multiplied with a factor 1.75

The following associated works are yet to be finished:

- **Four laning of approach road from Industrial By-pass Road to RCL Junction**
  Currently the 7 km stretch from Industrial Bypass road to RCL Junction of the port connectivity road is on ground level and the remaining stretch consists of flyovers and ramps. Of this 7 km stretch, 3.6 km long middle stretch is 2-laned with provision of expansion on the either side on the embankment. This is planned to widen to 4 lanes in order to meet increasing traffic requirements.

- **Construction of service roads**
  Service roads are required along the port connectivity road in order to provide the access to existing users on either sides of the road. Construction of these service roads on either side is planned in three phases and will be taken up as a part of Improvement of road infrastructure Phase – II.

The project would result into following benefits:

- It will result into substantial time savings for the incoming/outgoing port traffic
- It may result in increased flow of traffic which may result into increased economic activity
- As it links the port directly to NH-5, it would serve as bypass for commercial traffic and will result into reduced traffic congestion
- Due to better operating conditions for traffic the project may result into reduction in pollution levels (emissions and noise)

The table below provides cost of implementation and proposed time frame.

Table 7-1 Cost of Implementation

Project/sub project	Cost of (Rs. Crore)	Time frame
Main port connectivity road	114	Project is completed
Four laning of approach road from Industrial By-pass Road to RCL Junction	15	2007-08
Construction of service roads	24	2007-08

Adequacy of the existing connectivity

The future road traffic estimation (Annex 7.1) is based on the statistical data on cargo received and despatched by road (Port Administrative Reports).

As per the latest statistical data (2005-06), the traffic on the connectivity road is about 2408 PCU/ peak hour. This traffic is likely to grow to 3441 PCU/ peak hour by 2012-13 and 4515 PCU/peak hour by 2016-17. As per IRC (IRC: 106-1990) guidelines road capacity of four lane divided road is about 3600 PCU/ peak hour and should be sufficient to serve the traffic till 2012-13. The traffic may exceed the capacity by 2014-15; after which the port may require an additional connectivity to the national highway. This additional access to NH-5 can be from the Port/Convent Junction via Kancharapalem (about 15 km) to meet the requirements of the projected traffic increase.

7.1.2 Port internal road movement

VPT has recently constructed a road connecting the port with NH–5 which essentially links the port with its hinterland. The road mainly facilitates the outward movement of road traffic i.e. from port area to outside; however the inward movement of road traffic to the inner harbour areas and movement between IH – OH still have some problems. At present these areas are served by the internal roads, wherein the road traffic has to cross rail tracks (level crossings) at several places. This results in delays as the road traffic has to wait till the rail movements are over. Following sub sections detail the internal connectivity problems and identify the projects for resolving them.

Outer harbour connectivity

At present there is common road serving the outer harbour berths (GCB, Ore berth and container terminal, OSTT and LPG). The commodities handled at the outer harbour berths are mainly bulk cargo type and the modes like rail/conveyor/pipeline are used for their transport from and to the berth. Presently the container movement is predominantly done by CONCOR by railway and a very few number of containers may be transported (coming in or moving out) by the road.

In future the commodity profile is less likely to be changed except increased volumes of commodities. The modal share would remain same due to the bulk nature of the commodities and its typical handling requirements. Also the proposed mechanisation of GCB is like to eliminate the existing internal movements. In future the contributor to the road traffic would be mainly the container terminal.

The consultants have attempted to estimate the future road traffic based on traffic forecast. Annexure 7.3 presents the calculation details with the assumptions made. It is estimated to have traffic of about 137 PCU during the peak hour in the year 2012-13.

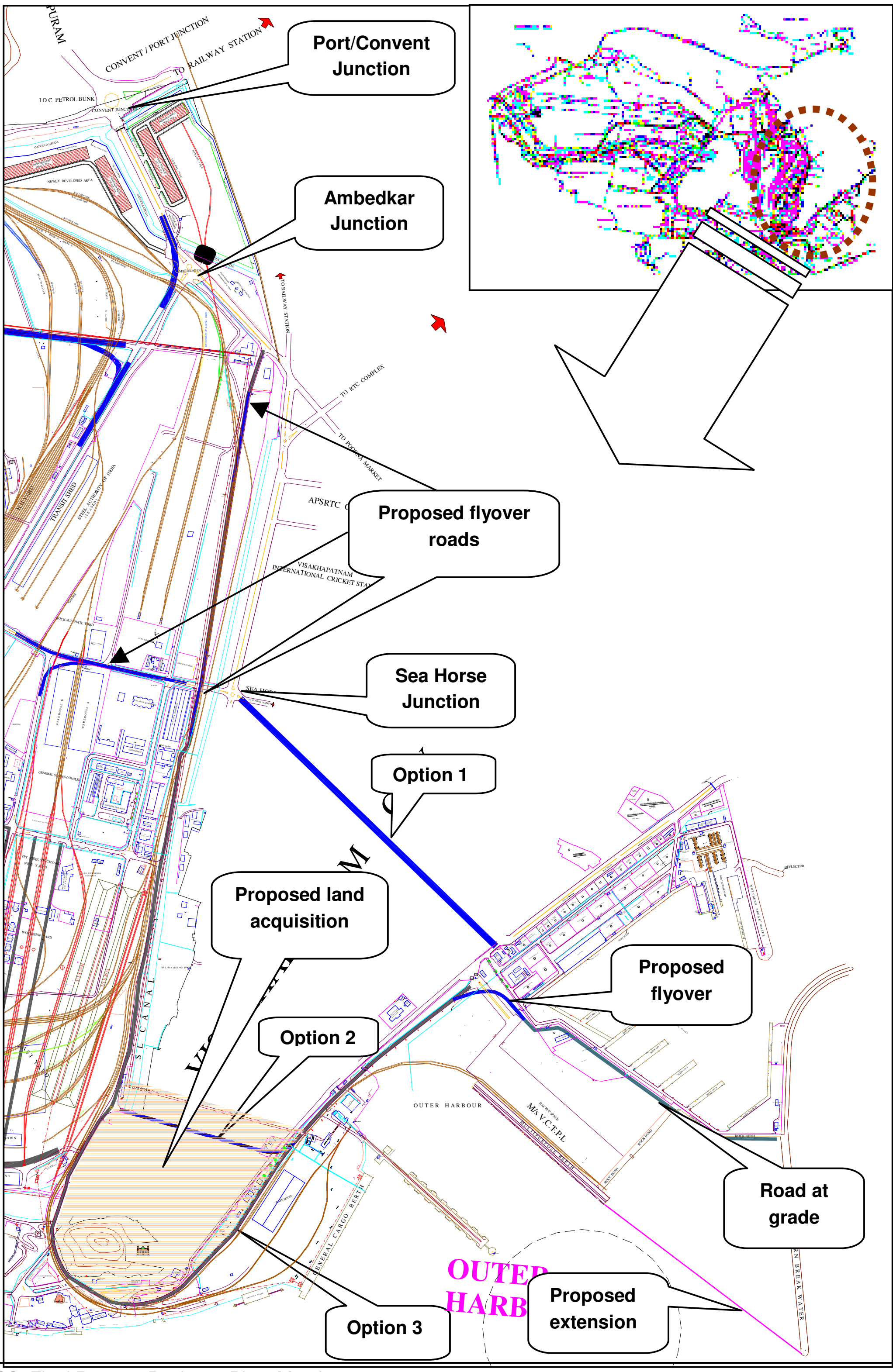
The proposal includes the development of the road corridor to facilitate traffic attracted/generated by the outer harbour. The three options considered were:

1. Connecting the Fishing harbour junction to the Sea Horse Junction with flyover road
2. Connecting the St. Allosyes School area to Mohsin Junction connecting the Port Road with flyover road
3. Improving the existing road form Khobbari Thota Junction to outer harbour (upto fishing harbour)

The first two options involve the road stretch passing through narrow roads of the city by constructing a flyover road. These options score low due to the fact that both these options fall outside of VPT jurisdiction and land acquisition may be more problematic (as it will involve relocation of the affected inhabitants). Considering these factors the improvement of existing road seems to be the practical option. Also there is a proposal of relocating the existing fishing harbour to another place and reclaiming the available area for development. Keeping this development in mind, the road improvement project should include the stretch from Khobbari Thota Junction to the fishing harbour junction. The existing road needs improvement on following points:

Lane width: the existing road width varies from one lane to two lanes (5 to 7 m) at some points. The estimated traffic is about 137 PCU during the peak hour in the year 2012-13. This traffic when compared to the road capacity of different lane configurations indicates that, two lane road (with capacity of 1500 PCU/ hr) should be sufficient enough to serve this traffic. This corridor assumes more importance since it is the only corridor for evacuation of cargo by road from the outer harbour keeping in mind the increased volumes at container terminal and possible development of the Fishing Harbour area in future. Considering these factors it is recommended to have provision for the width of about 16 m (4 lanes of 3.5 m with 0.5 m median and 0.75 m shoulders on either side).

Map 7-1 Outer Harbour Connectivity



Rail/road crossings: the rail tracks run parallel to the road stretch except at 200 m from super bazaar near Administrative Office Building (AOB), where the rail line changes the side. In order to avoid this crossing the rail lines are required to be shifted and arranged on only one side of the road (preferably on the west side).

Road traffic coming from Sea Horse Junction and Kobbari Thota Junction crosses this road. This could cause hindrance of the traffic.

In order to avoid this; the flyover roads as shown in figure are proposed at two locations one for the movement from OH to IH area and the other (just before the conveyor takes turn) to overcome rail crossings. Figure above shows the locations of proposed flyover roads.

The project would result into following benefits:

- Increased road width will provide better driving conditions
- Reduction congestion
- Reduction in delay to cargo movement
- Reduction in road accidents

Long term requirements

The future developments likely to happen in the outer harbour area are:

- Extension of container terminal and
- Development of fishing harbour

In this scenario, the Option 2 (as shown in the figure) would become appropriate provided VPT acquires the land upto the Mohsin junction (also shown as shaded in the figure) in future. This flyover bridge connecting St. Aloysius Junction to Mohsin Junction can be considered to avoid the route circumventing the hillock. This flyover can be then used exclusively for the out movement and the existing road can be used exclusively for in movement in future.

The table below provides cost of implementation and proposed time frame.

Table 7-2 Cost of implementation

Project / sub project	Cost of implementation (Rs. Crore)	Time frame
Improvement of road from Khobbari Thota Junction to the fishing harbour junction (widening from 2lane to 4 lane, 5000 m)	15	2007-09
Flyover roads on OH connectivity road (600 m, 4 lane 2 way + 2 ramps 300m 2 lane 1 way)	3	2007-09
Flyover road from outer harbour to inner harbour over (600m, 4 lane 2 way)	9	2007-09

Inner harbour connectivity

This addresses the road connectivity issue of the inner harbour berths on east/west quay. At these berths mix cargo (bulk + break bulk cargo) is handled. Roads are used for transporting to in/out of the port and also for the internal movement (i.e. transporting cargo from stacking area/warehouse to berth and also for movement between EQ and WQ berths). This movement of road traffic needs to cross rail tracks at several points, which makes this travel time consuming as the road traffic has to wait for giving way to the goods trains. Therefore adequate road connections avoiding rail level crossings should be provided to enable hassle free movement of traffic between east and west quay.

The proposal for inner harbour connectivity improvement includes development of new ramps to cater traffic attracted/generated at inner harbour. Movement in this area can be segregated into following movements:

Inward movement to EQ from outside the port – traffic entering from port junction and going towards EQ berths need to cross rail tracks at three points. As rail traffic is important and given priority of passing, the road traffic is hindered which is directly resulting into queue formation and loss of time in waiting. In order to solve this ramp can be constructed near Ambedkar Junction level crossing and facilitating the movement towards EQ north gate.

Outward movement from EQ port area – this traffic will have an exit from the newly constructed ramp (Ramp B of PCR) and merge with the new port connectivity road traffic.

Inward/outward movement to WQ from outside the port – traffic coming from outside port can enter through old road under the flyovers (old and new connectivity flyover road). It is proposed to use this existing road to form a semicircular turn and have a ramp starting just after the new flyover that will ascend and reach the crest at existing level crossing as shown in figure.

For the outward movement from WQ berths an additional ramp (2 lanes, 1 way) connecting road coming from WQ to new port connectivity road is proposed. This movement is also possible by the road circumventing the ore stacking yard.

Movement between EQ to WQ area – this connectivity can be achieved by constructing flyover roads on either side of the conveyor belt.

Movement from outside the Port – Via Kobbarithota junction up to seahorse junction and from there into the Port area westward wherein one arm towards TM's office and the other arm towards North gate, crossing the dumper lines and landing near the existing gate of EQ-7, thus facilitating the movement towards East Quays and West Quays via Ramp at GFCL.

All the proposals need to be analyzed once again thoroughly from the trade point of view just before finalizing the same in view of the fluctuating requirements so that the best fit is implemented (Applicable to all schemes).

Map 7-2 Inner Harbour Connectivity

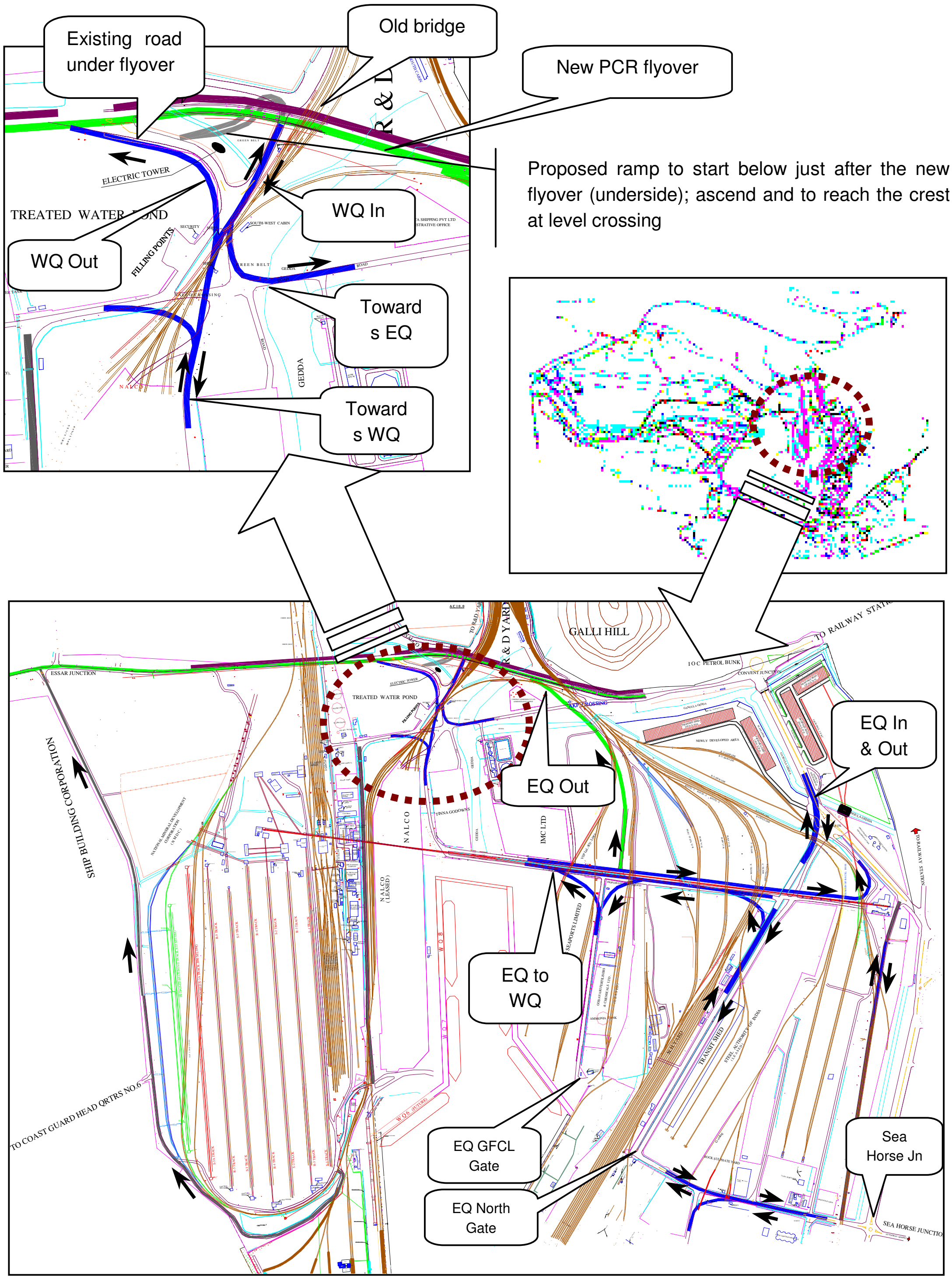


Table below provides cost of implementation and proposed time frame.

Table 7-3 Cost of Implementation

Project / sub project	Cost of implementation (Rs. Crore)	Time frame
In/Out movement to EQ to/from outside the port Ramp near Ambedkar Junction level crossing for facilitating traffic movement towards EQ north gate and GFCL gate 4 lane 2 way Total length approx. 600 m	16	2007 – 09
Outward movement from EQ port area	-	Already constructed
In/out movement to WQ from outside the port Flyover road for following movements: WQ In – 2 lane, 1 way 500m WQ Out – 2 lane, 1 way 700 m Towards WQ – 2 lane, 1 way 600 m Towards EQ – 2 lane, 1 way 500 m	34.5	2007 – 09
Movement between EQ to WQ area Flyover roads on either side of the conveyor belt From WQ to EQ – 2 lane 1 way, 1000 m From EQ to WQ with ramps towards – 2 lane, 1 way 1200 m	33.0	2007 – 09

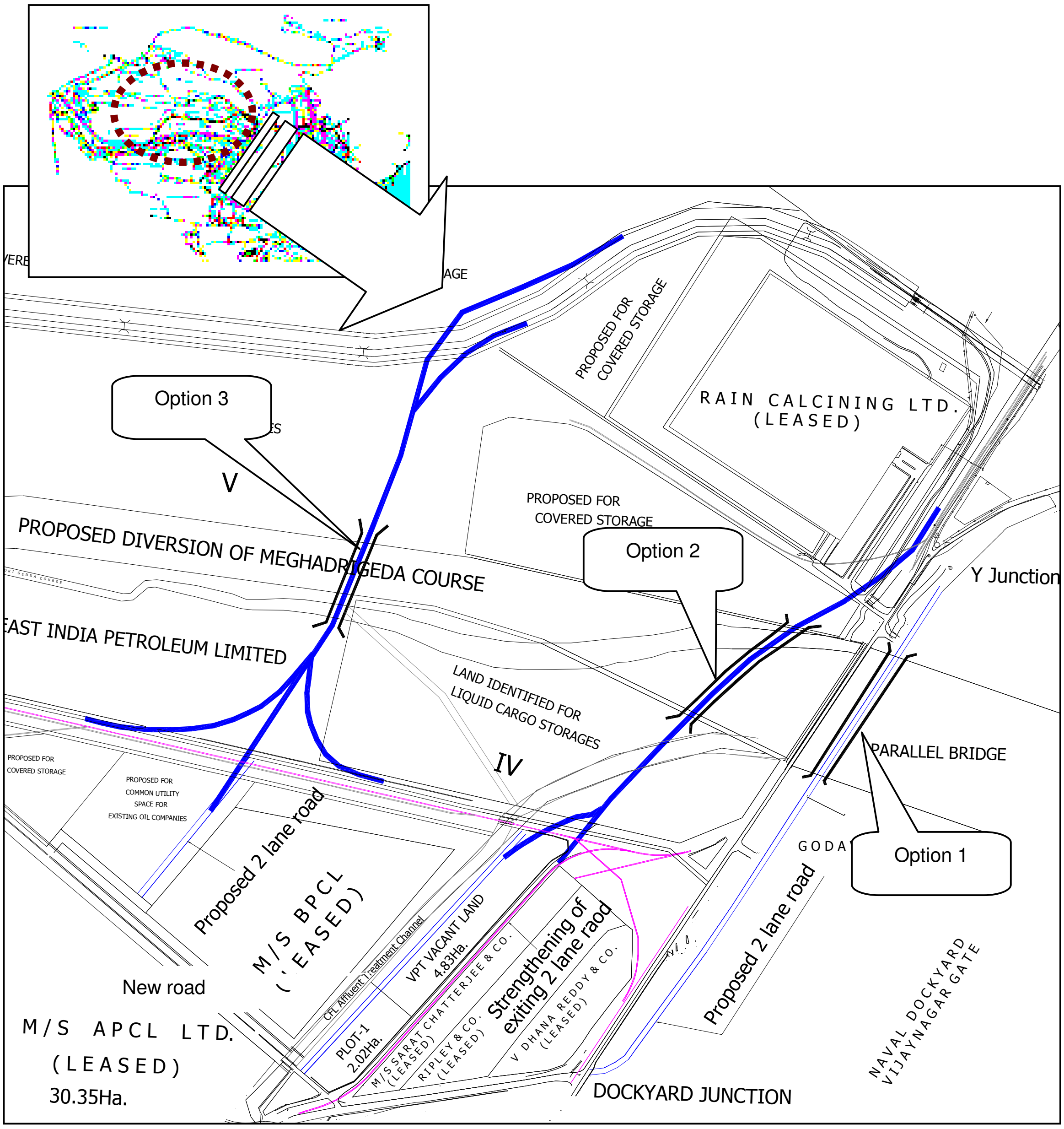
The project would have a positive impact as it will be facilitating traffic movements (as listed above) while avoiding existing road and rail level crossings, and thus resulting in a free flow of traffic and minimise turn around time.

Western sector connectivity

Presently the road traffic to and from western sector is facilitated through a road that connects Y Junction to Dockyard Junction. It is understood that navy may close this road due to security reasons. As such alternative arrangements to facilitate road traffic from and to the western sector port area is to be developed (towards RCL Junction). The options considered are listed below.

Option 1: This proposal aims at the construction of an additional road parallel to the bridge over Meghadrighedda and includes the widening of existing two lane road in to a four lane road from “Y” Junction to CWC /Naval Dockyard junction. The navy could ban the use of the road from Y” Junction to CWC /Naval Dockyard junction. In case this occurs new roads for the commercial have to be constructed. The other two options under consideration are mentioned below.

Map 7-3 Western Sector Connectivity



Option 2: Construction of a new 2 lane road on west side of BPCL plot which can continue further as a flyover road (4 lanes) leading to port connectivity road with a bridge over Meghadrighedda. For facilitating the traffic towards EIPL and CWC area two ramps can be constructed. Towards north end the flyover can have two ramps emerging out one to merge with traffic moving towards port junction and the other towards NH – 5.

Option 3: The existing road along M/s Sarat Chatterjee & Co. can be strengthened and can continue further as a flyover road (4 lanes) leading to port connectivity road with a bridge over Meghadrighedda. It may be required to relocate the existing siding facility of M/s Sarat Chatterjee & Co. in order to implement this which can be studied in detail while finalising the option. A new 2 lane road on the right side of the CFL affluent channel can be constructed which will connect to the existing road at grade and a ramp to connect it to the flyover road.

Figure below shows the various options to achieve this connectivity. All options include flyover roads considering the future sidings development planned in this area.

Out of these three options; option 1 is the cheapest one; however, it is ruled out due to the Navy's decision to ban the existing road for port traffic movement. Therefore one of the other two options is required to be selected. Out of the two, the option no 3 seems to be the better one and can be considered. It was suggested by the port that the option 2 may also be considered for the long term requirement.

Table below provides the cost of implementation and the proposed time frame.

Table 7-4 Cost of Implementation

Project / sub project	Cost of implementation (Rs. Crore)	Time frame
Option 1 Construction of additional road parallel bridge over Meghadrighedda is planned including widening of existing two lane road to four lane road from "Y" Junction to CWC /Naval Dockyard junction	10	Ruled out during DFR workshop discussions
Option 2 Strengthening of existing road along M/s Sarat Chatterjee & Co. (at grade, 2 lane 1 way, 800m) + New road along CFL affluent channel (at grade, 2 lane 1 way, 500m) + Flyover (4 lane 2 way, 1200 m) with 1 ramp (2 lane 1 way, 500m) + Bridge across Meghadrighedda (@ 300 m span)	52	2012-13
Option 3 Construction of a new road (at grade, 2 lane 500m length) + Flyover 4 lane, 2 way 1200 m with 2 ramps 2 lane 1 way each of 250m + Bridge across Meghadrighedda (@ 300 m span)	50	2007-08

Other road projects

Other road projects which can be considered are listed below:

- Road flyover from railway crossings at Elephant gate from CWC godowns behind Essar Plant to KR & Sons (Rs. 3.25 crore)
- Road from SBC junction to Meghadripeta along Westside of Essar palletisation plant (Rs. 1.75 crore)
- Road from Meghadripeta between boundaries of Navy and RCL upto port connectivity road junction at industrial bypass road (Rs. 1.3 crore)
- Road from return end of WQ1 upto the existing SBC road connectivity behind WQ5 to establish thoroughfare upto Essar palletisation junction (Rs. 0.25 crore)

These can be taken up for development depending upon the fund availability.

1. Four – laning of middle – 4 Km. Stretch of subject Port connectivity road.
2. Strengthening of existing 2-lane road between Y-Junction and convent junction including rehabilitation of bride.
3. Additional ramp parallel flyover of subject port connectivity.
4. Flyover with 4-lane road from Y-junction to industrial bypass road.

The above Phase-II works have been entrusted to NHAI to submit feasibility report and cost estimates.

Apart from these there are other general road improvement projects planned for upgrading the existing facility and mainly include projects involving pavement widening, strengthening etc. The project would result into better vehicle operating conditions and traffic movement. The table below describes the projects and provides cost of implementation and proposed time frame.

Table 7-5 Cost of Implementation

Project/sub project	Cost of implementation (Rs. Crore)	Time frame
Other road projects	6.55	2010-11
Providing new roads outer peripheral road and inner service roads along the new railway layout at east yard Strengthening the existing stretches + laying new roads (about 4 km 2 lane roads)	15	2007-08

The cost of 15 crore is inclusive of the proposed services road development for coal handling.

7.1.3 Rail projects

Adequate connectivity to port hinterland is very important as it helps smooth movement of cargo to and from hinterland (origin/destination). In case of Visakhapatnam port, the railway system assumes greater importance as out of total cargo handled at the port about 60-65 % cargo is rail borne cargo.

The following sections presents the transport requirements related to rail traffic movement and list the projects that can help in meeting these requirements.

7.1.4 Port connectivity with Indian Railway grid and associated projects

Development of R & D yard at Mindi and associated facilities

At present for the rail bound traffic there are two interchange points with the port viz. Ore Exchange Yard and R & D Yard. The Ore Exchange Yard has 18 lines and deals with iron ore traffic only. The R & D Yard has 19 lines and deals with other than iron ore traffic. Currently Ore Exchange Yard handles around 10-12 rakes per day and R &D Yard handles around 15-17 rakes per day.

Out of about 17 rakes handled at R & D Yard, 6 rakes are destined to Western sector per day mainly for the commodities like POL, fertiliser, FRM and general cargo and it involves traversing along 10 km length rail line. This traffic movement requires to cross the lines of iron ore traffic at diamond cross junction which is a bottleneck for movement of trains from R & D Yard to Western sector. This also results into detainment of rolling stock.

Presently out of total traffic handled at port, about 60-65 % traffic is received/despatched using railways. The port has planned new sidings along the port connectivity road in Karasa area and as a part of allotment of land under Phase – I development, which may result into growth in railway traffic in western sector. With increase in traffic in coming years, the load on railway system is bound to increase. The maximum number of rakes that can be handled at Ore Exchange Yard and R & D Yard is about 15 and 25 rakes per day respectively considering the factors such as availability of labour, wagon detention, availability of locomotive, movement constraints within port area, requirement of double operation and so forth.

The traffic forecast suggests that the traffic load in terms of number of rakes per day may increase to 14 and 42 at Ore Exchange Yard and R & D Yard respectively (refer to Annex ??). These figures suggest that the existing Ore Exchange Yard may have just sufficient capacity to handle the future rail borne traffic. R& D yard needs to be augmented to cope up with this increase in the traffic, especially the existing R &D Yard which can handle about 25 rakes per day as against required 42 rakes per day in future. There can be two options either to expand the existing R & D yard or to develop a new R & D yard.

In the first option there is almost no space for future expansion at existing R & D Yard. It is possible to add 3 new lines (extending break van siding by shifting vaccum plant to one side of the yard) at existing R & D Yard if the existing road along R & D Yard traffic building is shifted. This can help in increasing the capacity by about 4 rakes per day. However considering the increase in rail traffic, it is appropriate to develop a new entry point to port in the form of R & D Yard at Mindi in addition to the expansion of existing R & D yard. The proposed R & D Yard at Mindi will relieve the problem of existing R & D Yard congestion.

Also it is required to segregate the general traffic, which can be achieved by:

- Routing the thermal coal, steel, other coals, alumina, containers and some portion of general cargo traffic (about 28 rakes per day) through existing R & D Yard with addition of 1line as mentioned in internal transport projects - Construction of additional sidings - Laying of new railway line 1E in R & D Yard
- Routing the POL, Lime Stone, Fertilisers, FRM, Liquid Bulk and some portion of general cargo traffic (about 14 rakes per day) through the newly developed Mindi Yard

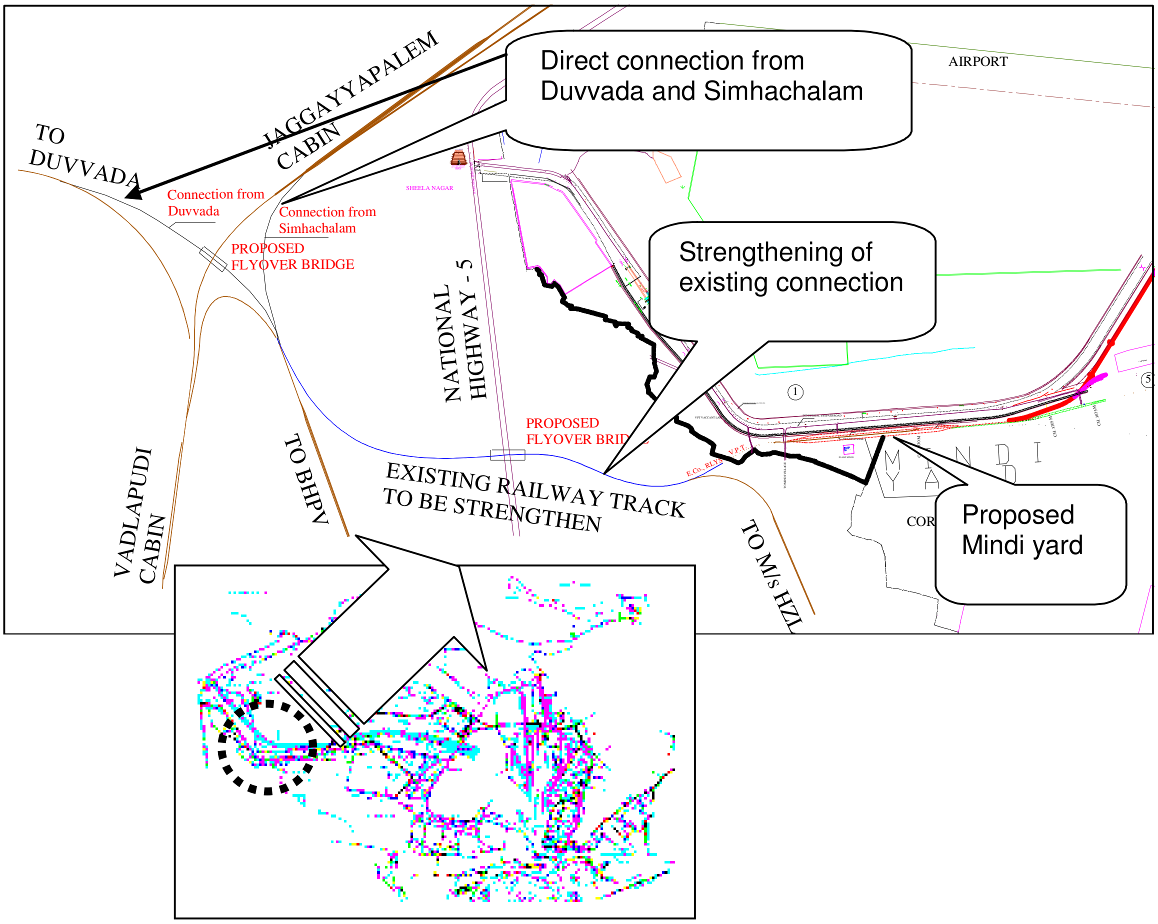
The project includes:

- Strengthening of existing connection between Mindi and Vadlapudi
- Construction of fly over bridge (4-lane) on NH-5 at BHPV for about 750 m where the existing railway line connecting Mindi and Vadlapudi crosses NH-5
- Direct connection from Duvvada and Simhachalam is also under consideration
- Mindi yard with facilities such as rail lines, cabins, railway electrification etc.

The proposed Mindi R & D Yard will have total 9 lines, out of which

- 1 for through traffic and engine escape
- 1 for periodical maintenance examination (PME)
- 1 for sick wagons attention
- 3 for receipt and
- 3 for despatch

Map 7-4 Development of R & D Yard at Mindi



The traffic at Mindi yard may be increase to about 14 rakes per day as per the traffic forecast. The Mindi Yard design has total 9 lines out of which 6 lines are for receipt and despatch. As the number of incoming and outgoing rakes will be more or less equal, if time taken for one set of trains may be taken as 12 to 15 hours. Thus on an average, each line can handle approximately 1.5 to 2 rakes per day. Thus available 6 lines would serve around 9 to 12 rakes per day as against the forecasted requirement of about 14 rakes per day. Considering this it is suggested that there should be enough land space available in case Mindi Yard expansion is required in near future. It is understood that there is space for adding 3 more lines on south side of Mindi yard in case expansion is required. If it is required to be expanded further then deleasing of the some part of Coromandel plot area will be required. On north side of the Mindi Yard expansion is not feasible due to the constraint imposed by NH-5.

The project would result into following benefits:

- Reduce the load on existing R & D Yard
- Reduction in train/wagon detention
- Reduction in internal travel between R&D yard and western sector (distance by 10 km)
- Reduction in fuel consumption for port locomotives
- Reduction in accidents due to reduction in traversing the number of crossings

- Better segregation of traffic can be achieved which may improve the working
- Reduction of about 20 km for Indian Railways in train movement

This project would involve participation from Indian Railways (IR) and VPT as it will benefit both. VPT that both IR and VPT may form a joint venture/ special purpose vehicle that will take care of funding and execution and maintenance.

Table 7-6 Cost of Implementation

Sr. No.	Name of the subproject	Estimated cost (Rs. Crore)	Time frame
1	Development of R & D yard at Mindi and associated facilities	100	2007-10

7.1.5 Other capacity improvement measures

Visakhapatnam port serves a wide hinterland comprising of around seven states of India and for various commodities such as thermal/coking/stem coal, fertilisers, fertilisers raw materials, food grains etc. The possible measures to improve the railway line capacity could be:

- Electrification
- Doubling
- Signalling and telecommunications improvement
- Freight trains scheduling

These improvement measures can help in free flow of traffic and will result into additional traffic which not only will help VPT but also the hinterland industries that depend upon VPT for their import and export. In light of these facts, following measures need to be taken up with the Indian Railways for implementation as they fall in the purview.

Following sections of railway tracks need to be taken up for doubling/electrification.

Doubling

a. Titlagarh – Raipur
b. Bilaspur – Bina
c. Kottavalasa-Kirandul (K- K) line - doubling of K-K Line (Kirandul – Koraput and Koraput – Kothavalasa sections). Recently the Ministry of Railways in its budget for the year 2006-07 has announced taking up of the survey work for this project.

Electrification

a. Vijaynagaram – Raipur
b. Bilaspur – Bina

7.1.6 Internal rail movement projects

VPT railway system is divided into iron ore traffic and traffic for other commodities. Iron ore traffic is managed through Ore Exchange Yard. All other traffic is routed through R&D yard.

Traffic from Ore Exchange Yard is handled in eastern sector which at present is about 10-12 rakes per day. Traffic from R & D Yard is destined to eastern as well as western sector and mainly includes commodities like POL, fertilisers, FRM, coal, steel products, alumina, container and general cargo etc. Out of about 17 rakes handled at R & D Yard, 6 rakes are destined to Western sector per day mainly for the commodities like POL, fertiliser, FRM and general cargo.

Providing additional connectivity to Mindi yard from RCL

The new sidings in Karasa area is intended to be developed in the future. It will require additional connectivity between the proposed Mindi yard and Karasa area. These sidings depend upon the future traffic expected to be attracted or generated in this area. VPT has already planned sidings or open areas on the vacant land in Karasa area mainly for agro based industries/general cargo. It is also understood that HPCL has asked VPT to allocate a land area of 400 – 420 acres for the refinery expansion, which is likely to result into increased POL traffic. Also as a part of land allotment phase – I, allocation of land for warehouse development was done and these warehouses are likely to open soon. The project includes:

- laying of 5.9 km of broad gauge track starting from RCL to the proposed Mindi Yard
- It will have 13 numbers of culverts
- One major bridge across Meghadrighedda

Map 7-5 Additional connectivity to Mindi Yard

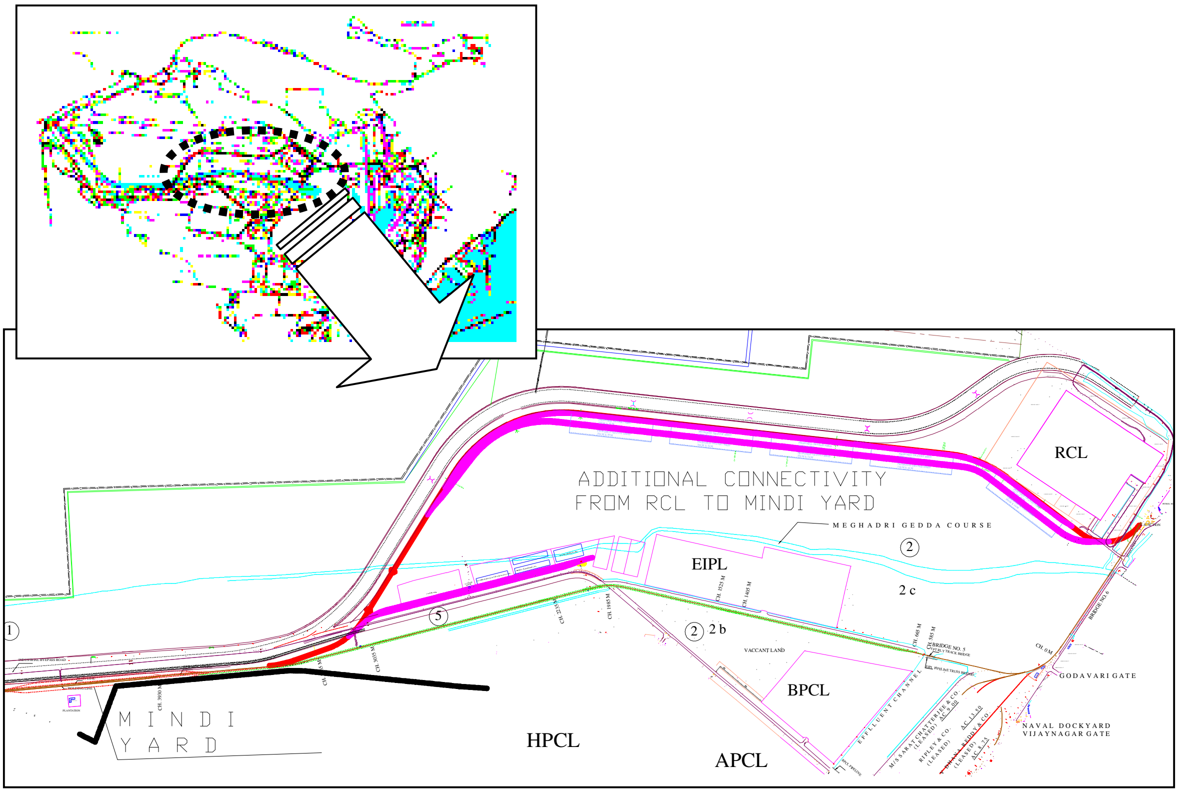


Table 7-7 Cost of Implementation

Sr. No.	Name of the subproject	Estimated cost (Rs. Crore)	Time frame
1	Additional connectivity to Mindi Yard from Karasa	30	2007-09

The project would result into following benefits:

- Help in serving future rail borne traffic destined to Karasa area more efficiently
- Will function as complementary to Mindi yard

Revamping east yard

In order to reorganise the stacking area and enable efficient handling for coal the existing curved rail tracks have to be removed and replaced by straight rail tracks which are coming directly form the R&D yard. It is proposed to revamp the existing rail line of east yard in order to be able to handle 6 full rakes in a straight line with a locomotive escape facility.

The project includes:

- Laying of 6 full rake capacity railway lines for manual loading
- Laying of 2 full rake capacity railway lines for mechanized loading with wagon loader
- Laying of Conveyor tracks for mechanized Coal handling

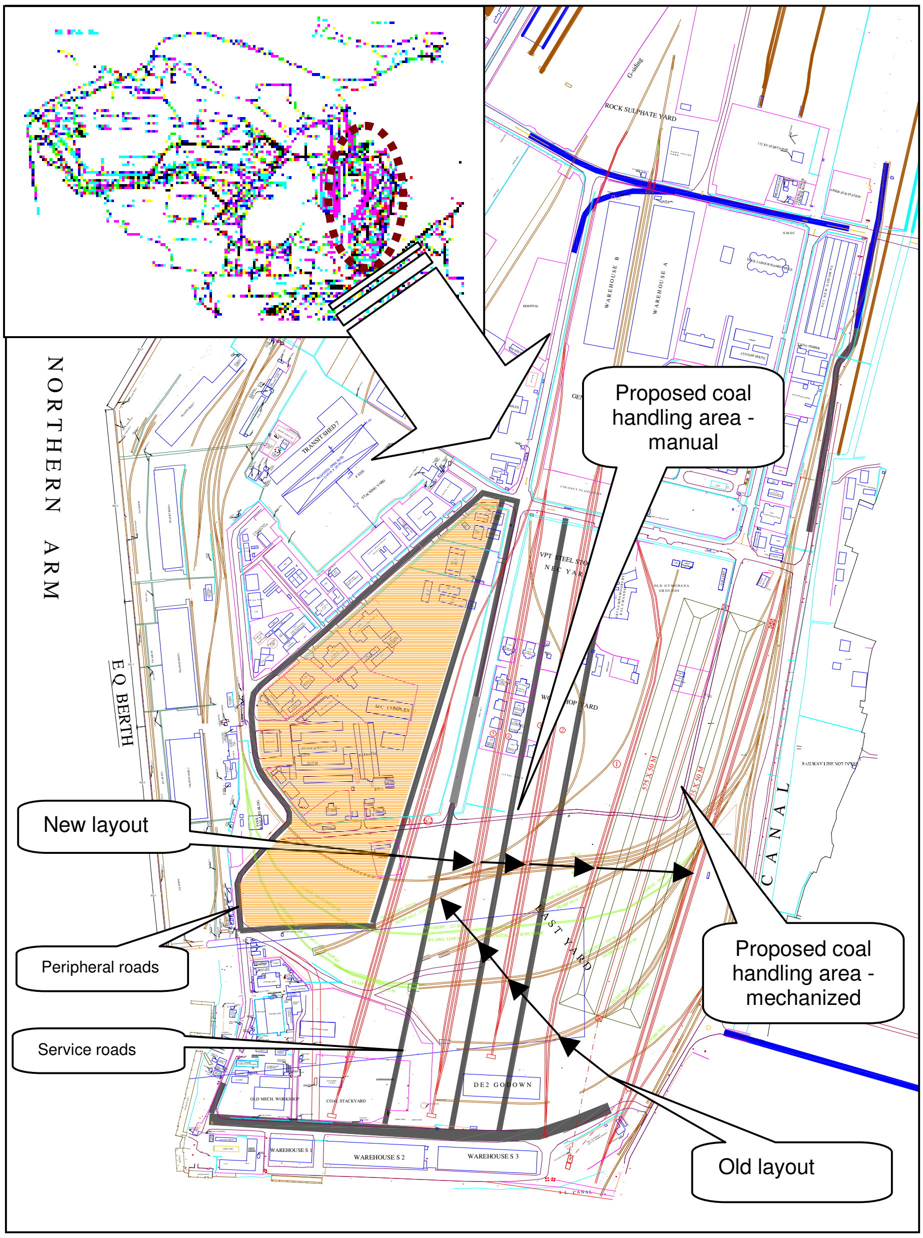
Mechanisation of coal handling

Revamping of east yard is linked to GCB mechanisation. GCB mechanisation will result into faster coal handling at berth and transport to the east yard by conveyor. Removing this coal from east yard will be a challenging task as it would depend upon the availability of the rake for loading and its movement through R & D Yard. Proposed revamp plan has 6 lines for manual and 2 lines for mechanical loading. The traffic forecast projects that the coal traffic (coking, steam & other) is likely to reach around 12 million tonnes per year by 2012-13, which translates into average 11-12 rakes per day.

At the same time capacity of R & D yard through which the coal traffic is handled would not be enough to handle the traffic as it has to cater to other general traffic also. Under such circumstances, development of Mindi yard can relieve the situation. It is required that the western sector traffic (such as POL, Fertilisers, FRM and others) can be segregated and routed through Mindi yard and the movement of coal can be given priority at the existing R & D yard.

As a part of road projects for improving OH – IH connectivity, a flyover road connecting outer harbour to inner harbour over east yard rail lines is proposed (see above figure). The requirements of this road project should also be considered while implementing east yard revamping.

Map 7-6 East yard revamping



The project would result into following benefits:

- Full rakes can be handled in a straight line which would save the time required for pacing rakes and actual operations time for loading
- Restructuring would enable the effective utilization of the stacking area by increasing the stacking capacity to two, 40,000 sqm against 95,000 sqm.

Table 7-8 Cost of Implementation

Sr. No.	Name of the subproject	Estimated cost (Rs. Crore)	Time frame
1	East yard revamping	7.5	2007-09

Railway other internal projects

Following sections list the other internal rail improvement projects such as construction of additional sidings, modernisation and improvement of the existing rail system.

Construction of additional sidings

VPT has decided to lay additional sidings in the entire port area in view of the future traffic increase; as it necessitates the increase in the rail cargo handling capacity. The details of these sub projects are provided in table below.

Table 7-9 Cost of Implementation

Sr. No.	Name of the subproject	Estimated cost (Rs. Crore)	Time frame
	Eastern sector		
1	One siding (track length of 680 m) between H-7 shed and Sea Horse Junction for container traffic	1.0	Aug 07 – Feb 08
2	One siding (track length 1100 m) at West of R & D Yard for facilitating rail bound cargo handling for existing sheds of lessees	2.5	Aug 06 – Dec 07
3	Extension of existing railway line (by about 2 km) in outer harbour catering to container terminal upto fishing harbour. There is a proposal of relocating the existing fishing harbour to another place and reclaiming the available area for development in future. Keeping this development in mind, the existing rail line can be extended to serve the fishing harbour area.	5.0	2010-11
4	Laying of new railway line 1E in R & D Yard to increase the holding capacity	2.5	Jan 08 – Dec 08
5	One siding (Track length 1100) east of OHC along M/s ONGC for facilitating rail borne cargo handling	2.5	Aug 06 – Dec 07
	Western sector		
1	One siding at EIPL area along industrial bye-pass road	2.0	Jan 07 – Sept 09
2	Five additional sidings (5 tracks each 685 m) along North & South sides of JP Line. Out of these 5 one will be laid now (i.e. JP2)	12.5	Aug 06 – Mar 08
3	Five additional sidings (5 rail lines each 700 m long) in Karasa area taking off from internal rail connectivity	15.0	Aug 08 – Mar 09
5	Laying of an additional line between RCL level crossing and NAD level crossing towards north of existing Railway lines	2.5	Aug 06 – Mar 08

Modernisation and improvement of existing rail system

Modernisation of existing rail system includes strengthening existing sidings by constructing retaining walls, hard surfacing, pathways, illumination and other facilities for better working conditions and maintainability. Improvement is a continuous process and includes strengthening level crossings, the replacement of fish plated joints by short welded joints, extension of existing lines etc. The various projects include:

- Hard surfacing, proper illumination and provision of pathways along all existing railway sidings
- Strengthening of railway crossings with PCC blocks as these are settled due to heavy rail/road traffic
- Extension of exiting R-8, R-14, R-15 lines and Route Z of NH Yard and 2nd bulb line at western sector for holding full rake capacity
- Laying of BG Railway Track from R & D yard to Western Sector across Dumper yard in the vicinity of 28-lever cabin.
- Conversion of existing mechanical points in R & D yard to RRI points at Anakapalli level crossing of south cabin
- Up gradation of 60 sets 1 in 8 points and crossings on wooden layout with PSC layout including special size sleepers of railway lines of port area. In 1st. phase and balance points & crossings in 3 phases of 75 sets (21 crores)
- Revamping of RRI cabin at OHC (5 Crores)
- Up gradation four cabins of R&D yard to RRI system (10 Crores).
- Railway staff building at sidings in western sector (0.5 Crores)
- Providing Winch Operated lifting barrier gates at VPT railway manned level crossings including construction of Gumpties
- Conversion of existing fish plated tracks into short welded rails in order to reduce the maintenance (can be taken up phased manner)
- The existing vacuum plant in between lines may be shifted to one side of the yard and dead end line may be extended towards North Side, so that another full rake line is available.
- Laying of additional line along new A.V.R. line with engine escape and about the increasing the AVR-1 and AVR-2 line for handling together one full rake.
- Connecting Western and eastern empty grid lines to 1A line, so that non KK rakes can be handed over to VPT instead of returning back to Railways at OEC.
- Existing connection to B-line at OHC Elephant gate is to be up-graded as it can be utilized for receiving more rakes.
- Panel Interlocking of Load grid points is to be required in lieu of RRI/Cabin points.
- In view of additional traffic at East Yard, up-gradation of 14 lever gumpty.
- Connection of Link line by laying Diamond crossing at VDR & Co., in view of direct connectivity form CFL end.
- Purchase of higher capacity locomotives.

The project would result into following benefits:

- Strengthening will improve the life of the component
- Hard surfacing, proper illumination and provision of pathways will improve the working conditions
- Extension of existing lines will be useful for handling full rake capacity

The estimated total cost of implementation is approximately Rs. 46 crores with estimated duration of the project of about 4 years from year 2006 to year 2010.

7.2 Summary

7.2.1 Road projects – summary and recommendations

The consultants propose to implement the following projects:

- Outer harbour connectivity improvement involving
    - Improvement of road from Khobbari Thota Junction to the fishing harbour junction facilitating movement to/from Port Junction to Outer harbour berths (upto Fishing Harbour) with an estimated cost of about Rs. 15 crore
    - flyover roads on the above OH connectivity road and one connecting outer harbour to inner harbour with an estimated cost of about Rs. 12 crore
- Inner harbour connectivity improvement includes following proposals
    - In/out movement to EQ to/from outside the port - Ramp near Ambedkar Junction for facilitating traffic movement to/from EQ north gate with an estimated cost of about Rs. 16 crore
    - In/out movement to/from WQ port area – flyover road with ramps to facilitate WQ in/out and movement towards WQ and EQ with an estimated cost of about Rs. 34.5 crore
    - Movement between EQ to WQ area (both ways) – flyover road on either side of the conveyor with an estimated cost of about Rs. 33 crore
- Western sector connectivity for which three options are possible. Out of these option one, additional road parallel to the bridge over Meghadrighedda is the cheapest one. However, this option was ruled out due to the decision of the navy to ban the existing road. Out of the other two options, the option no 3 seems to be the better one and can be considered for implementation. It was suggested by the port that the option 2 may also be considered for the long term requirement.

The other smaller projects for general improvement of the road system have to be taking into account according to the availability of budget.

7.2.2 Rail projects - summary and recommendations

The consultants propose to implement the following projects:

- Development of R&D yard at Mindi and associated facilities with direct connections from Duvvada and Simhachalam. The estimated cost of implementation is Rs. 100 crores.
- Providing additional connectivity to Mindi yard from RCL, between the proposed Mindi yard and Karasa area where the storage capacity is planned. The estimated total cost of implementation is Rs. 30 crore.
- Revamping the east yard for the new storage including service road for coal and mechanical handling for coal with an estimated cost of about Rs 13.98 crore

The other regular modernisation and improvement projects for general improvement of the railway system have to be taking into account according to the availability of budget.

8. ENVIRONMENTAL PROJECTS

8.1 Introduction

Considering the various potential sources of pollution, pollution control measures are suggested at either the source of pollution or at the receiving environmental component. Adoption of these measures would help keep the pollution control costs to a minimum.

Environmental projects are a key component of every Port operation and construction program. Port's capital improvement programs must provide funds for needed environmental measures. The Port's environmental programs are as varied and vital as its economic programs.

8.2 Air Pollution Control

8.2.1 GCB and Coal Berth

As already mentioned, coal is being handled at GCB and inner harbour. Some of the coal is unloaded at GCB to reduce the ship's weight and then taken to inner harbour for further emptying of the ship. Also as mentioned, VPT is planning to deepen the entrance channel to 14 m depth. In this context, the following is the recommendation for handling environmental problems at GCB:

- Coal handling at GCB should be fully mechanised so that coal dust problems are avoided. Mechanised handling includes:
    - A completely closed belt-conveyor from the ship to storage yard;
    - Belt-conveyor into the ship and unloading of coal from ship to conveyor by using sloping chutes rather than drop;
    - arranging chute to feed conveyor in the direction of the flow;
    - using high-capacity conveyor at low speed rather than low capacity conveyor at high speed reducing conveying movement and number of transfers.
- Mechanisation of loading operation into wagons/trucks using small conveyor belts and hoppers;
- Sprinkling of water on the coal dikes;
- Providing multilayer greenbelt around the storage yard;
- covering trucks and wagons with tarpaulins while transportation.

For sizing and cost estimation of the above project the basic data required is distance from berth (ship) to storage area and area of storage sites.

8.2.2 Vessel Emissions:

Exact emissions of pollutants from vessels are not known. To arrive at these emissions, data on fuel consumption by the ships and its quality is required. The following are some of the measures experimented and implemented in other ports, which VPT may also consider:

- Switch over to cleaner-burning fuels in their auxiliary diesel engines and diesel–electric engines once they are within the reach of the port.
- Cargo-handling equipment such as forklifts and cranes, calling for replacing or retrofitting their engines with those using "best available control technology."

- Low-sulphur fuels are technically feasible and are being used by some vessels elsewhere
- Emission standards for new Category 3 marine diesel engines installed on vessels. Marine diesel engines differ from other diesel engines in terms of their exhaust, cooling, electrical, and fuel systems. Category 3 engines are large diesel engines used for propulsion power on container ships, tankers, bulk carriers, and cruise ships.
- The IMO is also framing rules for cutting down shipping emissions. In May 2005, an IMO regulation on engine emission standards for NOx came into force for engines above 130 kilowatts, in the form of Annex VI of the International Convention for the Prevention of Pollution from Ships. The rule includes a global cap of 4.5% by mass on sulphur content of fuel oil and recommends monitoring of sulphur content globally. The IMO is also encouraging countries to declare their coastlines as "SOx Emission Control Areas" (SECAs), where sulphur content in fuel must not exceed 1.5%.

> Under the marine fuel directive adopted by the European parliament in April 2005, all ships in the Baltic SECA and passenger vessels in European Union (EU) territorial waters will have to use fuel with a 1.5% sulfur limit after 11 August 2006. The 1.5% sulfur limit will apply to the North SECA (which includes the English Channel) after 11 August 2007. The sulfur limit will be 0.1% in fuel used by passenger vessels and seagoing ships at berth in EU ports after 1 January 2010. These measures are expected to reduce shipping-related SO_2 in the EU by over 500,000 metric tons a year from 2006.
>
> Besides marine fuel regulation, the EC is encouraging research to assess the economic and technical feasibility of SO_x and NO_x abatement technologies such as shore side electricity, seawater scrubbing, selective catalytic reduction, and the use of humid air motors. The EC also favors fiscal incentives and voluntary measures to encourage the use of low-sulfur fuels and green technologies by ship owners.

- Another emission reduction strategy is to cut idling time of vessels and tugboats by providing electric power on shore. An additional benefit of using shore side electricity is the elimination of noise and vibration from the auxiliary engines while they are at berth. Plugging in to onshore power requires retrofitting power systems or ships, and that involves new investments; it may not be economically viable for infrequent visitors. (The Port of Los Angeles has signed a lease with container terminal operator P&O Nedlloyd that would require the company to use shore power for ships at berth and alternative fuel yard tractors, and possibly employ low-sulphur fuel in vessel main engines.)
- Reducing the speed of vessels as they approach a port can also help cut emissions. The plan requires ships to reduce their speed from 22 knots to 12 knots or less. (About 70% of ships calling at the ports of Los Angeles and Long Beach participate in a voluntary speed reduction program implemented since 2002. The strategy is sweetened by a financial incentive; operators qualify for a 15% discounted dockage rate during the following 12 months if 90% of their vessels comply with the 12-knot speed limit for a year. In the first six months of 2005, speed reduction at the Port of Los Angeles saved 266 tons of NOx emissions.)

Vehicular pollution

VPT should adopt clean fuel policy for port vehicles. All the port vehicles should be converted into either CNG or LPG driven.

8.3 Noise Pollution Control

Noise should be prevented rather than controlled. Installation of electrical systems instead of pneumatic ones will reduce noise levels. Rubber padding -may be provided with the noise generating equipment. Mufflers should be provided wherever possible to reduce noise levels from mechanical operations and workers in noisy areas should be provided with ear muffs to prevent hearing loss. To arrive at the cost of this project, data on the noise generating areas, number of workers in the area, etc. are required.

MoEF guidelines for ports and harbours recommend that noise levels should be kept below 85 dBA at a height of 5 feet anywhere in the occupational work area at the port. In addition, the ambient noise standards for various areas as per Central Pollution Control Board should be maintained. Taking these guidelines into consideration, the horns installed on the vessels should be of specific standards (certified by BIS) to avoid excessive noise generation. To combat the noise impact, a physical barrier should be provided between the harbour area and the nearby residential houses. This can be achieved by planting trees. Two to three rows of trees will result in good attenuation of noise. In between these rows bushes of various heights need to be planted. For costing purpose, length of greenbelt to be developed is required.

8.4 Water Pollution Control

8.4.1 Slurry tank and pumping system on iron ore berth

As already mentioned, a continuous discharge of iron ore slurry into sea has been observed. To reduce the pollution problems from this, a slurry holding tank is proposed on the iron ore berth. This would contain a tank, a slurry pump, and sludge thickening facilities. Iron ore even can be recovered from this tank.

For ascertaining the size of the tank and whole project, data on the approximate quantities of slurry getting discharged into sea is required.

8.4.2 Wastewater from City

City sewage comes to VPT through SL canal, Gangula gedda, Yerra gedda and a Katcha Drain. These drains carry wastewater of Visakhapatnam city coming from various directions. Wastewater from Gangula gedda and Yerra gedda joins near STP. Part of this wastewater (10 MLD) is treated in sewage treatment plant, while SL canal and Katcha Dran meet harbour water without any Treatment. Katcha Drain carries sewage from Airport Area and Nanakpura area and meets inner Harbour in North Western Arm near Navel Dock yard. Exact quantities of city sewage are not known. City growth is expected to lead to a further rise in the population density. Consequently the pollutant discharge load will also increase. In addition, industries may come up leading to secondary growth. Discharge of untreated pollutants from all these sources could affect the water quality of the harbour. Hence discharge of untreated effluents into the harbour will have to be restricted.

Port has one sewage treatment plant which receives about 7 to 8.5 MLD sewage from Yerra gedda and Ganula gedda. VPT had already planned to have one more treatment Plan of 10 MLD capacity but since Visakhapatnam Municipal Corporation is planning to divert all the drains meeting harbour water, an additional treatment plant may not be feasible hence this proposal has been placed on hold. If VMC will intercept and divert all drains meeting Harbour water, most of the city sewage problem would be solved.

Data on quantities of sewage from SL canal, Yerra gedda, Gangula gedda, and Katcha drain is required. In addition, pollutant loads in all these canals are required to assess the size of sewage treatment plant and treatment scheme. A clear understanding on VMC's proposal is also required to plan for the additional STP requirements.

8.4.3 Industrial Waste Water

Port Authorities informed that all the industries in the Port area having individual treatment plant. Treated wastewater, which is been discharged through effluent channel and Exim park channel. Harbour water is been regularly monitored by Andhra Pradesh Pollution Control Board. Although there is a provision to provide a copy of treated waste waster report to Port (environment cell) for their reference but It has been found that some times these industries are not reporting to Port. The following activities need to be taken up by VPT to assure pollution control from industries:

- VPT should form a committee to investigate the industrial pollution problem and undertake mitigative measures under its guidance. The committee involves its own officials, officials from pollution control board, industry representatives, and Visakhapatnam Municipal Corporation.
- Undertake a thorough study on the investigation of quantities of effluents discharged by each industry in the port area and assess the quality of effluent of each industry. While assessing the quality, samples should be taken after the effluent leaves industry premise.
- Construct a CETP by taking contributions from the industries. The CETP may contain a flocculater, aeration tanks, aerobic/anaerobic treatment, chemical treatment if required, oil skimmers, sludge separator, etc.

If quality of effluents and approximate quantities are available, a treatment scheme and cost of CETP may be worked out.

8.4.4 Garland drains around storage yards

Various types of cargos are stored in the open storage yards. The flying dusty cargo and the leachates of some of the cargos is cause for concern. Thus, the following measures are proposed:

- Provide a proper lining/flooring in the storage yards
- Provide garland drains and collect the contaminated water in collection pits adjacent to the storage area. The cargo can be recovered from this slurry.
- A multilayer greenbelt around the storage areas. This greenbelt should cover trees of various heights, and bushes in between trees. This greenbelt would prevent transportation of dusty cargo to far off places.

Data such as area of each storage yard, dimensions of the storage yards, type of cargo stored are required to arrive at the type of lining/flooring (for any special flooring requirements), size of the collection pits, area of the greenbelt, etc.

8.4.5 Contaminated Sediments Disposal

The sediments should be monitored once in every season, for different chemical and biological parameters to assess the extent of contamination. Regular monitoring may be taken up at harbour area. The sampling points for monitoring could be in stagnant areas and fishery zones and near terminal sites. The USKPA standard for the sediment quality is given in the below.

Table 8-1 USKPA standard

Sediments in Fresh and Marine-Waters	% Concentration (dry wt basis)
Volatile solids	6.0
Chemical Oxygen Demand	5.0
Total Kjeldahi nitrogen	0.10
Oil and grease	0.15
Mercury	0.001
Lead	0.005
Zinc	0.005

When concentrations of one or more of the parameters (given in the preceding table) in sediments exceed the limits, the sediment will be considered polluted and, therefore, unacceptable for open water disposal. This necessitates adoption of a suitable disposal method for the dredged sediment.

Suitable disposal methods like confined upland disposal and capped disposal in sea/ocean may be adopted for contaminated dredge spoil.

The contaminated sediments may be effectively isolated by placing them in sub-aqueous sites and covering or capping them with a layer of clean material. The capping material should be denser than the contaminated material. It can be done with clean inert material such as sand and silt.

After identifying the contaminated sediments in the harbour water, suitable dredges should be selected so that the resuspention is minimal during dredging. The contaminated sediments should be handled to minimise the contact time between water and sediments at both dredging and disposal sites.

While selecting the disposal site, the following criteria should be carefully considered:

- stability
- erosion potential
- ecological sensitiveness

Deep pits inside the water bodies are ideal capping sites provided the leachate does not contaminate the surrounding groundwater.

8.4.6 Dredging

The potential impacts of dredging have already been discussed in detail earlier. The following measures are recommended to mitigate these impacts.

- Vacuum dredging (cutting and sucking) should be used instead of mechanical dredging as far as possible, since mechanical dredging creates turbidity in water.
- When mechanised dredges are used, it is suggested that the dredging should be started from the upstream end to the water current and continued in the downstream direction, to minimise the deposition of resuspended sediments in the downstream area.
- The development of environmentally sound spoil disposal practices requires an intimate knowledge of die biological communities associated with a specific disposal site. This includes not only knowledge of ecologically and/or commercially valuable species that may be adversely affected, but also of the kinds of benthic species that may eventually recolonised the modified substratum. The following parameters are to be examined prior to the selection of the disposal option.
    - Nature and composition of dredged material: grain size, water content, organic content, and nature of clay minerals
    - Nature of the receptor: water body, land
    - Ecology of the region: substrate compatibility, diversity and adaptability of species, ecosystem dynamics
    - Disposal site characteristics: nature of disposal site, water depth, currents - speed and direction, size and frequency of waves.

Open water disposal and capped disposal of the contaminated sediments may be considered in the present case:

- Open water disposal
- Capped disposal of the contaminated sediments, with clean sediments in sub-aqueous environment

Capped disposal of contaminated sediments is already discussed earlier. Open water disposal of dredged sediment is becoming increasingly popular worldwide. During disposal, there are generally very small releases of any potentially harmful chemical constituents into the water column as the dredged sediments are in a physico-chemical equilibrium with the environment from which they are taken. Clay-bearing sediments of the dredged material have minimal chemical impacts on the receiving environment as certain clays and humics can sequester (partition) harmful toxicant from aquatic biota. Potential impacts are first evaluated by comparing the sediment quality at both the dredging and disposal sites. If the quality of the sediments in the dredging site is better or similar to the sediment quality at disposal site, disposal will not have unacceptable adverse impacts on the disposal site environment. In this case the dredged material can be dumped in open water without restrictions and Dredged material can be disposed in open water by direct pipeline discharge to avoid higher turbidity in water column. The disposed material should not be allowed to accumulate and reduce the depth of water column.

8.5 Protection to coastal morphology:

The issue of protection to coastal morphology had been the prime concern to designers of the port during the construction of Inner harbour in 1933 as well as construction of Outer harbour in 1976. During the construction of Inner harbour in 1933 with the Island break waters, the gap between shore and south tip of break waters was a depositing area for the sand (littoral drift) to the tune of a million tonnes of sand a year brought by the wave induced currents etc. The breach was slowly eroding and port had taken necessary measures to nourish the breach by pumping the dredged material from the sand trap. Similarly, during the break water construction in Outer harbour, the Ramakrishna beach, north of Visakhapatnam Port, would have been washed away but for the measures taken by the Port for collection of sand in the sand trap and pumping is out for beach nourishment. The Port is spending Rs.8 to 10 crores annually on beach nourishment, though unremunerative, only keeping in view the imminent need to protect he coastal morphology. Unless similar measures are taken by the Gangavaram port developer, for which normally a private developer may not come forward as it is an infructuous expenditure when viewed from commercial angle, there is every possibility of erosion of beach at YARADA where a village exists. This may result in exposing the village to cyclones leading to destruction of life and property besides acting detrimental to the Govt. of Andhra Pradesh's vision of developing this area with resorts to attract tourists.

Further the non-adherence to the Environment protection aspects may result in huge loss to the high valued properties and housing colonies abutting the beach. With no further sand coming into sand trap, the wave energy will create disturbance at the berths in the existing outer harbour. In view of these aspects, the protection to the coastal morphology is a serious concern and there is a need to ensure such a critical activity is kept under Government control and not left to the whims of a private developer.

8.6 Wastes from ships and Oil spills:

The business plan envisaged an increase in the number of vessels plying in harbour area. While on-board pollution generated from individual vessel may be negligible, accumulated pollution from all vessels may be significant. Wastes from vessels are mainly of three categories: sewage, oily wastewater (from fuel storage tank, tank washing and bilge water), and garbage. VPT officials informed that no vessels are allowed to discharge waste in harbour water at present. Most of the vessels coming to VPT have treatment plant and they are discharging treated waste in mid sea.

At present no specific mechanism has been observed to monitor waste discharge from vessels. Considering the increased traffic and their frequency of operations, stringent monitoring of all vessels is recommended. VPT must ensure that vessels coming to harbour must have treatment facility on board. VPT may also have effluent treatment facility so that In case it is required to hold the effluents on the vessel for a longer time, all the wastes collected in these holding tanks may be discharged into the proposed on-shore treatment plants. In this case safety measures should be taken to prevent generation of septic conditions and formation of toxic and inflammable gases on board. Similarly garbage and other solid wastes from individual vessels may also be transferred to the garbage collection bins at port. Charges may be levied on vessel operators towards meeting the treatment and disposal costs of liquid and solid wastes, depending on the volumes disposed. Garbage and other solid wastes from individual vessels may also be transferred to the garbage collection bins at terminals. Charges may be levied on vessel operators towards meeting the treatment and disposal costs of wastes, depending on the volumes disposed.

Oil spills from tankers during loading and unloading may be a major pollution problem at POL terminals. Containment and retrieval of fuel oil from water should be carried out to prevent the spread of oil in waters. India is party to MARPOL convention (MARPOL 73/78). India has signed to comply with the following annexures of the above convention/protocol:

Annex I: Prevention of pollution by oil
Annex II: Control of pollution by noxious liquid substances
Annex III: Prevention of pollution by harmful substances in packaged form
Annex IV: Prevention of pollution by sewage from ships
Annex V: Prevention of pollution by garbage from ships

As per the IMO protocol VPT needs to have facilities to handle the following pollutants:

- Oily waste
  - Oily bilge water
  - Oily residues (sludge)
  - Oily tank washings (slops)
  - Dirty ballast water
  - Scale and sludge from tanker cleaning
  - Oily mixtures containing chemicals
- Noxious Liquid Substances
- Garbage
- Sewage
- Ozone depleting substances

Out of these, VPT has facilities to collect only oily bilge water and oil and sludge. VPT has informed a privately operated reception tank of 100 KL collects these wastes. Tanker can go on berths and collects the wastes. No details are available on where these wastes are taken by the contractor.

Floating oil booms are already used by VPT to contain spreading of oil spill. The booms should be 60-120 cm above and below the water surface. These will surround the tankers during loading and unloading. Retrieval of contaminated oil can be achieved by oil skimmers. The oil skimmers may be provided with long arms to also clear oil slicks, which might accumulate under the jetty. The retrieved oil should be stored in small containers and sold to licensed vendors directly or VPT may install an oil-water separator for separation of oil from water.

In addition to oily water, the port needs to have a system to treat sewage and bilge water received from the ships/tankers. If the ships treat the sewage on their own, then, VPT should maintain the records of treatment details, quantities of treated sewage, discharge location, etc. The cost of treatment will be borne by the shippers based on the nature and quantity of effluent discharged.

The ETP should be designed in such a way that the treated effluent will meet standards for discharge into coastal waters. The sludge from the ETP should be thickened and stabilised before use or disposal. A part of the sludge could be utilised as manure for greenbelt development after ensuring that the concentrations of heavy metals and other pollutants in the sludge are within safe limits. The rest could be used for land filling.

8.7 Environmental Management Cell

VPT has a separate Environment Management Cell (EMC) for maintenance and operation of the pollution control system, monitoring of pollutants and development of green belt. Although EMC has a multidisciplinary team of professionals but It is recommended that the VPT should strengthen existing

Cell to address environmental management concerns. The cell should be given qualified persons who will be responsible for regular environmental quality" monitoring, proper operation of pollution control equipment and ETPs, and liaison with regulatory bodies such as the Andhra Pollution Control Board (APPCB). It is also recommended to provide infrastructure in terms of computes and vehicle to manage data base and field monitoring activities. The Cell should be given more powers to implement pollution control measures as per ISO 14001 and EMPs of various departments and should also be given authority to enforce existing industries to follow pollution control measure.

Broad Functions of EMC are envisaged as:

- to ensure that STP function properly and meet effluent discharge standards
- to ensure systematic and routine housekeeping, especially at the terminals
- to maintain the greenbelt
- to remove oil slicks from the water
- to create awareness of pollution hazards among all VPT personnel related to the harbour area , especially those involved in cargo handling
- to maintain environmental quality' analysis laboratory and analyse air, water, sediment, and soil samples on a regular basis

Laboratory and Equipment

Analytical laboratories should be set up to carry out routine analysis of water and sediment samples. This laboratory is proposed after considering the workload to be created in future. Essential equipment required in the lab is given below. This is in addition to the equipment required for collection of samples.

- Single pan balance
- pH meter
- Conductivity meter
- Dissolved oxygen meter
- Incubator
- Flame photometer
- Microscope
- UV/Visible Spectrophotometer

Regular field visits of the EMC personnel are required in the harbour area for collection of samples.

8.8 Environmental Appraisal and Monitoring Compliance Mechanism

Highlights of applicable Port's Environmental Appraisal and Monitoring Compliance Mechanism are outlined below to ensure that Port expansion and development activities comply with applicable environmental regulations.

8.8.1 Environmental Appraisal

Under Environment Protection Act and Rules, Environment Clearance is required for expansion and operation of existing ports .The government agencies for granting Environmental Clearance are Ministry of Environment and Forest, Ministry of Surface transport State Pollution Control Board depends on nature of the project.

Responsibility of giving Environment Clearance to all Schemes having investment more than 50 Crores and new Ports lies with Ministry of Environment and Forest. State Pollution Control Board is responsible for giving Consent for Construction and Consent for Operation.

In accordance with Ministry of Environment and Forests, Notification on Environmental Impact Assessment of Development Projects, dated the 27th January, 1994 (amended on 4th May, 1994), any new project or the expansion or modernisation of any existing industry or project listed in Schedule-I shall submit an application to the Secretary, Ministry of Environment and Forests, New Delhi.

The application is made in the proforma specified in Schedule-II of this notification and must be accompanied by a Project Report which, among other items includes an Environmental Impact Assessment (EIA)/Environmental Management Plan (EMP) Report prepared in accordance with current guidelines issued by the Central Government in the MoEF.

Prior to the submission of the EIA/EMP report to the Impact Assessment Agency of the MoEF, “Consent to Establish” from the concerned SPCB is required. The EIA/EMP Report must be accompanied by appropriate Consent to Establish documents.

The EIA/EMP report submitted by the project proponent is evaluated and assessed by the Impact Assessment Agency, and if deemed necessary, it may consult the Committee of Experts having a composition as specified in Schedule-III of this notification.

The Impact Assessment Agency prepares a set of recommendations based on technical assessment of documents and data furnished by the project authorities, supplemented by data collected during any visit to sites or factories, as well as any required interaction with affected population and environmental groups. Summaries of the reports and recommendations and the conditions under which the environmental clearance is given are made available, subject to the public interest to the concerned parties or environmental groups on request. Public comments may be solicited, if so decided by the Impact Assessment Agency, within 30 days of the receipt of the proposal in a public hearing arranged for the purpose. At least thirty days advance notice of such hearings must be published in at least two newspapers. The public shall be provided access, subject to their interest, to the summary of the EIA/EMP reports at the headquarters of the Impact Assessment Agency.

The assessment is completed within a period of 90 days from receipt of the requisite documents and the data from the project authorities, and completion of public hearing where required, and the decision is conveyed within thirty days thereafter. No construction work, preliminary or otherwise, relating to the setting up of the project may be undertaken till the environmental and/or site clearance is obtained.

In order to enable the Impact Assessment Agency to monitor effectively the implementation of the recommendations and conditions subject to which the environmental clearance has been given, the project authorities concerned submits a half-yearly report to the Impact Assessment Agency. Subject to the public interest, the Impact Assessment Agency shall make compliance report publicly available.

If no comments from the Impact Assessment Agency are received within the time limit, the project is deemed to have been approved as proposed by project authorities.

8.8.2 Monitoring Compliance

The monitoring compliance can be done by:

By Regional Offices of MoEF

As mentioned previously, compliance with the requirements of approved EMPs is monitored by Regional Offices of the MoEF. The project authorities submit half-yearly compliance reports to these offices.

By State Pollution Control Boards

Besides monitoring the compliance of the EMPs, the SPCBs issue "consent to operate" to the individual project. The "consent to operate" (also called the Consent Order) is of two types: 1) the Emission Consent, as per provisions of Air (Prevention & Control of Pollution) Act, 1981 and 2) the Discharge Consent, as per provisions of Water (Prevention & Control of Pollution) Act, 1974. The consent to operate embodies conditions which the State Pollution Control feels appropriate for the project to operate in environmentally compatible manner. These conditions are imposed upon the project and the compliance report is submitted by the project at intervals specified in the Consent Order. The regional offices of the SPCBs play important role in monitoring the compliance of the Consent Order.

Besides the Consent to Operate, the project authorities are also supposed to submit the annual Environmental Statement to the Board by 30th September every year, in Form-V, for the last two financial years. This report basically contains the input to the project / unit of product, the pollution load from the project, details of the hazardous waste generated by the project and the measures taken by the project for improving the environmental conditions.

By Central Pollution Control Board

The CPCB, in fact, is not directly involved in monitoring the compliance conditions of the projects. The prime responsibility of the project is to monitor the quality of rivers and lakes, as well as air quality at the national level. The CPCB is also supposed to lay down, modify or annul the standards for rivers, lakes, and other water bodies. It is at this level of monitoring the quality of rivers/lakes water quality and the national ambient air quality where an interface between consent to operate by SPCBs and Central Pollution Control is observed, as far as monitoring the environmental attributes is concerned.

8.9 Summary

The summary of the environmental projects is given in the table below

Table 8-2 Environmental projects

S.N	Projects	Cost (Rs. Lakhs)	Path/Benefits
1	Shifting of coal handling from GCB to coal berth and mechanisation of coal berth		Covered as part of main projects
2	Controlling of vessel emissions and vehicular pollution		This is a recommendation - VPT has to consider various options with ship operators
3	Provision of earmuffs and other equipment to workers and at noisy environments	5	VPT has to provide /To avoid health hazards
5	Construction of slurry holding tank on iron ore berth	25	VPT has to construct /To Avoid harbour water and aquatic flora and fauna contamination
6	Detailed quantitative and qualitative Investigation of City wastewater meeting Harbour area and install a Sewage Treatment Plant to treat city sewage	2,500	VPT has to construct /To avoid harbour water pollution
7	Study for industrial wastes and finding out suitable solution	50 for study (tentative Cost of ETP would be 40 lacks per mld)	Consultant has to be engaged to examine and control harbour water pollution
8	Provision of flooring, Garland drains, collection pits, and greenbelt around Stacking yards, and ancillary port activities	1,400	VPT has to construct/To restrict polluted surface run off meeting harbour water and Air pollution control
9	Disposal of sediments		Recommendation
10	Change of dredges for capital dredging		Recommendation to put condition in tender documents
11	Handling of wastewater and oil spills from ships	100	Recommendation
12	Strengthening of Environmental Management Cell	200	VPT should strengthen existing Cell to address environmental management concerns. The cell should be given qualified persons who will be responsible for regular environmental quality" monitoring, proper operation of pollution control equipment and ETPs, and liaison with regulatory bodies such as the Andhra Pollution Control Board (APPCB)
13	EIA for all Construction Components	100	EC is mandatory by MoEF and SPCB. For EC detailed EIA is required EIA would take at least 12 months which include 9 months monitoring
14	Slope protection in inner harbour	500	VPT should ensure that sufficient slope protection is taken care of.
Total		4,880	

9. ORGANISATIONAL AND OTHER MEASURES/POLICIES

9.1 Institutional setting of the port sector in India

9.1.1 The Indian Port Sector: An Overview

India has almost 7517 km of natural peninsular coastline strategically located on the crucial East-West trade route, which links Europe and the Far East. The coastline is serviced by 12 major ports and about 187 minor and intermediate ports. As of today, the 12 major ports of the country handle about 75 per cent of the traffic. They are Chennai, Cochin, Ennore, Jawaharlal Nehru (Mumbai), Kandla, Kolkata, Mormugao, Mumbai, New Mangalore, Paradip, Tuticorin and Visakhapatnam. The minor ports, has a pronounced accent on the west coast. The minor ports are located in Gujarat (40), Maharashtra (53), Goa (5), Daman & Diu (2), Karnataka (9), Kerala (13), Lakshadweep (10), Tamil Nadu (14), Pondicherry (1), Andhra Pradesh (12), Orissa (2), West Bengal (1) and Andaman and Nicobar Islands (23).

The 12 major ports, except Ennore, placed under the Union list of the Indian Constitution, are statutory bodies (trusts) administered by the Government of India under the **Indian Ports Act, 1908 and the Major Port Trust Act, 1963.** The Ennore Port has been set up as a company under the Companies Act, and is called Ennore Port Limited. Some of the states like Gujarat and Maharashtra have set up of maritime board and are very active in promoting the maritime sector.

Each major port (except Ennore) is governed by a Board of Trustees appointed by the Government of India; their composition gives dominance to public enterprises and government departments. The powers of the trustees are limited and they are bound by directions on policy matters and orders from the Government of India.

9.1.2 Private Sector Participation in Indian ports

The Government of India, which administers the major ports, has realized that port restructuring is essential for the competitiveness of Indian exporters. By this, they are able to enjoy the efficiencies and low costs in transportation as are available to their competitors elsewhere. The Government also recognizes that the additional port capacity to meet the projected traffic cannot be achieved unless there is massive private investment in the increase of port capacity. The Government of India, therefore, decided to adopt the concept of landlord ports, and gradually secure private participation in the provision of port services. Accordingly, in October 1996 policy guidelines were issued which provided for private sector participation/investment in the following areas:

- Leasing out existing assets of the port.
- Construction/creation of additional assets, such as:
    - Construction and operation of container terminals.
    - Construction and operation of bulk, break bulk, multipurpose and specialised cargo berths.
    - Warehousing, container Freight Stations, storage facilities and tank farms.
    - Cranes/Handling Equipment.
    - Setting up of captive power plants.
    - Dry-docking and ship repair facilities.

- Leasing of equipment for port handling and leasing of floating crafts from the private sector
- Pilotage
- Captive facilities for port based industries

As a part of this initiative the procedure for inviting private participation and the criteria for evaluation were prescribed; model tender documents and concession agreements were also formulated. The major ports were advised to identify projects for private sector participation on the basis of viability, and proceed to take steps to obtain private investment.

As a further step towards securing private participation, policy guidelines were issued in 1997 to enable the major ports to set up joint ventures with foreign ports, minor ports or private companies. The Major Port Trust Act was amended to give effect to the guidelines issued in 1996 and 1997.

In view to realize the Land Lord port model, Major ports need to gear up and align the organization structure for such requirements. Consultants have proposed changes in the organization structure which are discussed in the next section.

9.2 Reasons for improvement

The Major Ports in India are governed by the Major Port Trust Act (1963) and at present, the major ports do no have the operational freedom to act on its own and as a result the efficiency in the ports is affected by;

- a bureaucratic system resulting in a slow decision making process
- existing cargo handling methods which generate low productivity levels;

The Port has substantial financial means to improve its competitive position by implementing new handling techniques. However, the bureaucratic system has an overall impact on the quality of port operations and makes it rather complicated to achieve a level playing field with the minor and private ports. The main reason is the time-consuming decision making process within the VPT as well as between the VPT and the Ministry of Shipping, and it can be stated that the existing delegation of powers do not reflect the need of a modern entity in a heavily competitive environment.

The following arguments will illustrate the shortcomings of the existing situation:

- The delegation of financial powers does not exceed 50 Cr Rs for investments and 100 Cr Rs for replacement investments and these amounts have not improved since 1996. For the port sector, characterised by major infrastructural capital investments these amounts are rather low.
- The procurement procedures for investments are time consuming and its take months before decisions are approved by the Ministry of Shipping and the port can start with the implementation. Any additional time needed compared with private ports has its impact on the competitive position of the port.
- Time consuming and two staged clearance procedures in case of private sector participation in the port
- New infrastructure can nowadays only be financed by PSP.
- The tariffs are guided by TAMP, which only reflects the Major Ports and it is recommended to come to a level playing field with the minor and private ports.

Moreover:

- The position of the Labour Unions is very strong and the existing system with the dock workers is hampering the competitive position of the major ports.
- Promotion of employees is based seniority and does not guarantee qualified professionals in the positions needed.
- Even rather day to day activity such as sending employees abroad for training or making business trips requires the permission of the Ministry and it can last for months before the approval is given.

From an economic point of view it leads to:

- A failure to distinguish between the different reasons of existence of a port. Profits and expenditure control lead to a disincentive to invest as existing operations may be (highly) profitable to the port but detrimental to the customer, but the alternative income opportunities are not properly taken into account. Even when the TAMP regulations allow profitable tariffs to be charged, port user benefits are lost.
- Due to the lack of an adequate investment plan in the past, unnatural profit streams from inefficient operations occur. The port realises high profits from vessel related charges, partly due to the high number of vessel shifts which are necessary to alleviate the congestion at the berths. This could have been avoided if the port had the opportunity to react quicker on the changing market circumstances.
- Misinterpretation of risk or loss of cargo. The fact that unnatural profits can be realised, indicate that the user is willing to pay for better services. Likewise, the fact that the cargo is routed via the port, despite high user cost indicates the inelasticity of demand for the port's services.

In order to come to a level playing field with the minor and private ports it will be necessary to have more autonomy. A policy to achieve this is to corporatize the major ports. Corporatization involves converting the ports intro companies independent of authority and decision making, granting operational freedom and flexibility in managerial decision making. The ports can, as such, can act as commercial entities in the prevailing market oriented circumstances.

9.3 Organization structure for Visakhapatnam Port Trust

9.3.1 Policy of VPT

For a further prosperous development of Visakhapatnam Port, it is important that it will become highly efficient. This can only be guaranteed by an organisational set up that is clear for the port users. As one of the overall suggestions and recommendations in this Visakhapatnam Port plan, consultants recommend to restructure the existing port organisation. The present organization structure of the port resembles the traditional line functions applicable to the service port model. The port has already succeeded in attracting the private participation in container as well as the cargo traffic and is in line with the Land Lord port model. This business plan suggests many developments in infrastructure at sea as well as at the land side. It has also proposed mechanization in cargo handling to enhance the performance and meet the international standards. This can be brought in by private participation and a major part of the terminal handling, now being done by the port authority, is to be carried out by private operators.

The following lines are recommended to follow for restructuring the organization of VPT:

- *Modernisation* of the port administration aiming at improvement of the management of Visakhapatnam Port as well as port operations and services;
- *Commercialisation* of port activities and/or port services. This implies a change in the behaviour of the port services in such way that the activities will be carried out based on market principles; and
- *Corporatisation* of Visakhapatnam Port Trust

Adopting the concept of a landlord port model requires first of all institutional changes. Consultants recommend corporatising of the VPT as such the VPT will act as an independent unit under the corporate law. The shareholders could be the Government of India and/or the State of Andhra Pradesh.

The VPT will become a Port Authority with as main functions port developer, custodian and maintainer. A change in the name of the new organisation is recommended in line with this transformation: **Visakhapatnam Port Authority (VPA).**

9.3.2 Objectives of VPT "new style"

By adopting the land lord model the corporatised VPA acts then purely as:

- stimulator of the port as logistic nodal point;
- developer and maintainer of port areas, entrance channel, terminals, jetties, storage areas, etc; and
- lessee of port property: long/short term lease/concessions for mainly infrastructure and in some cases superstructure.

These functions require amendments of the VPT's charter (Articles of Association) and of the port bye-laws. The amendments will cover the regulation and responsibilities of the port and its customers in terms of obligations and liabilities. In this revision exercise special provisions need to be laid down on leasing of infrastructure and the ruling of the transfer of equipment and manpower to the private sector.

The position of the Harbour Master is essential in the Landlord model, as the Harbour Master is responsible for the safety and environmental matters in the port. His responsibilities and tasks are related to:

- traffic safety and environment (safety control of shipping and protection of the marine environment). This implies the management of nautical matters such as lighthouses, VTS and Aids to Navigation;
- inspection of port and maritime security according to IMO-standards;
- enforcement of the rules and regulations
- determination of navigability of port entrance, entrance channels, berths, etc.; and
- maritime education and training.

In order to be able to carry his responsibilities and tasks according to (international) professional standards and the fact he is responsible for the enforcement of the laws, rules and regulations, it is recommended that the Harbour Master reports to the Ministry of Shipping and Transport of India instead of to VPA. This prevents potential conflicts of interests such as maximization of throughput and associated traffic (VPA's interest) versus traffic safety in the port (public interest).

9.3.3 Transformation from VPT to VPA

The transition to the new structure is based on the following main assumptions:

- The management of the VPA consisting of the Board of Port Commissioners and Board of Directors;
- The staff departments aimed at providing internal services within the VPA;
- The line departments carrying out the port related activities.

Although under a Landlord model PSP can be introduced for the Marine Services and the Internal Rail Transport, it is recommended that these services will remain under the responsibility of the VPA. The main reason is to avoid the creation of monopolistic situation within the port area. It is recommended to create separate business units for these activities

With respect to the terminals, it has been decided to introduce PSP for the handling of cargo except for the Iron Ore Handling Complex. It is recommended to concentrate this activity in a separate business unit and to modernise and commercialise this unit in order to create the possibility to privatize the unit In the future.

The internal railways will be placed in a separate business unit. The organisation of this unit will be similar to that of the Ore Handling Complex, with a proprietary technical staff, so that the unit acts on a stand-alone basis, which may be privatised on a later date (if and when the monopoly issues can be overcome).

The following activities can be outsourced:

- medical services can best be provided by professional organisations and the VPA could restrict itself to a small department for first medical assistance and necessary specialists for the monitoring of the medical services;
- Housing is a secondary labour condition to staff and forms part of the collective labour agreement with unions. There is however no reason that VPT should continue to manage this activity as external organisations (housing corporations/municipalities) can provide for maintain residential complexes (at cost). The secondary benefits to staff should not need to change as a result of outsourcing.
- Other Non Core activities such as the dry docks, floating cranes will also be outsourced.

Taking into account the existing organisation the following changes per department are recommended:

- Administrative services contains activities such as information and Public Relations, the law section, sport section, the Hindi cell etc will get a place in the new structure as staff departments or sections. More emphasis will be given to the public relations ad the legal affairs.
- Financial management services dealing with the expenditures and revenues, the pension, stock verification and auditing is the financial centre of the organisation and will as such have

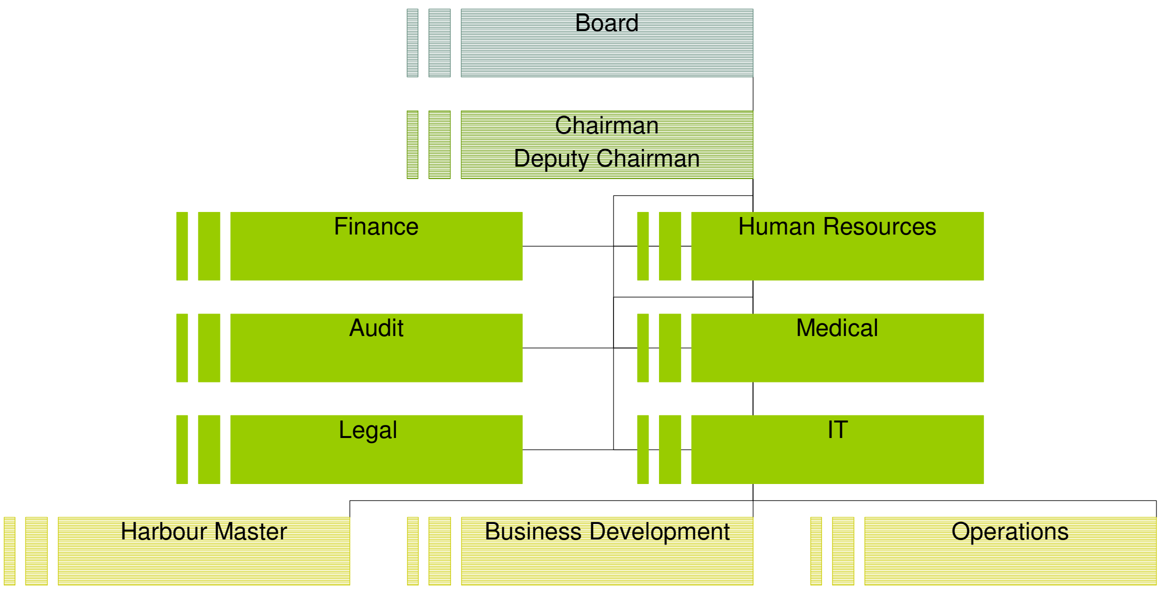
the same function in the new organisation as a staff department. It is recommended to automate the activities using modern financial management techniques.

- Human Resource Management dealing with the personnel affairs will be a staff department and should be responsible for all matters regarding the labour policy such as primary and secondary labour conditions, the recruitment of personnel, and the pension conditions.
- Engineering Service Management is presently dealing with the maintenance of the locomotives, the dry dock, the electrical systems, floating craft and crane, vehicles, the iron ore complex and the OSTT. In general it can be stated that the port handling will be carried out by private operators and they are responsible for the equipment used on the terminal and/or other activities such as the dry dock. This implies that the activities for the Engineering will be limited to Internal Rail System and the Ion Ore Handling Complex. These engineering activities will form part of the respective business units, so that no matrix organisation remains.
- Material Management Services dealing with the stores for e.g. spare parts is in the new situation either active as in the private sector or will be integrated in the business units for Iron Ore, Internal Rail transport and Marine Services.
- Knowledge Management is essential for the future development of the port. Not only having knowledge of the latest developments in the field of port operations, port infrastructure but also in the field of marketing and economics, IT, etc. This department will be part of the business development.
- The Marine Operations Services dealing with the safety and environment in the port, the navaids, pilotage, towage and the fire station will remain under the responsibility of the VPA.
- Port Operations Management dealing with stores, Iron Ore Handling, the Railways and shipping will in the new situation be part of the business units for the Iron Ore Complex and the Internal Railways.
- Port Planning and Management dealing with many activities in VPT such as the General Management, master planning, design, maintenance of the infra structure will in the new situation be allocated over other divisions and/or business units.

9.4 New Organisation structure

In view of above the VPT will be transformed into a corporate body acting under the corporate law and the new organization will act as a Port Authority. The organisation shall focus on marine services and commercial services aided by the support functions. Consultants have perceived the following organization structure befitting for the future needs of the VPA.

Figure 9-1 The proposed organisation of VPT new style



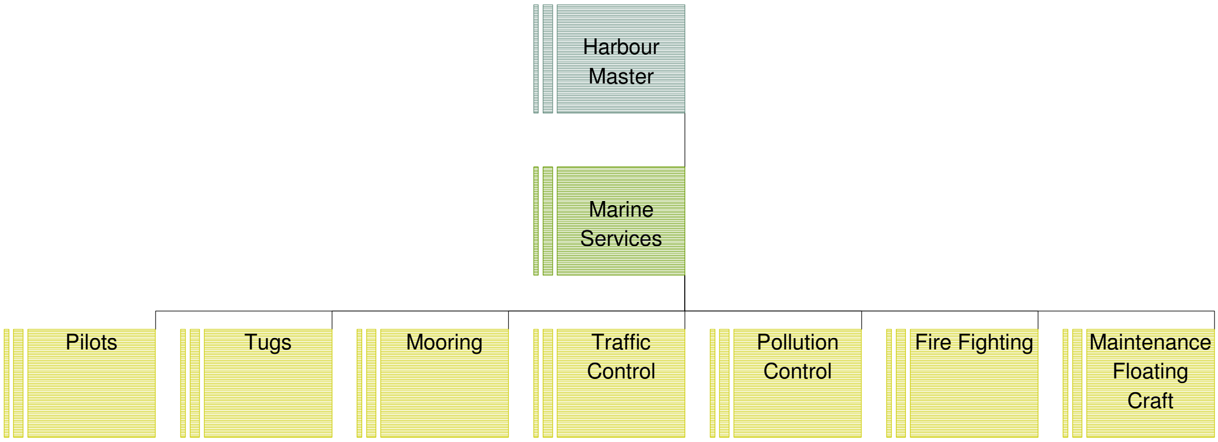
In the new structure of the corporatised VPT the following layers can be distinguished:

- The board of the organization consisting of representatives of the shareholders;
- The management of VPA
- The staff departments (indicated in green) such as Finance, HRD, Legal, etc
- The departments in line:
    - Marine Services
    - Business Development
    - Operations

9.4.1 Marine services:

The marine services will remain as a prime activity for the port and will include pilot-age, towage, mooring, traffic control, pollution control, fire fighting and maintenance of the floating crafts. The Marine department shall also gear up to automate the resource scheduling and shall take the independent charge of vessel scheduling including allotment of berths.

Figure 9-2 Marine Services Department



The employee strength for the Harbour Master office (including pollution control and monitoring fire fighting), the marine services for operational personnel and the engine side are given in the table below:

Table 9-1 Manpower required at Marine operations

					Engine side			
Function	Tugs launches	shifts	As per tribunal	**Subtotal**	shifts	As per tribunal	**Subtotal**	**Manpower needed**
HM office								**15**
Tugs	5	3	6	**90**	3	2	**30**	**75**
Pilot	2	3	3	**18**	3	1	**6**	**24**
Mooring	4	3	3	**36**	3	1	**12**	**48**
Survey	1	1	3	**3**	3	1	**3**	**6**
General Purpose	4	2	2-3	**21**	3	1	**12**	**33**
Floating crane	1	1	10	**10**	3	5	**15**	**25**
Sagar Turga	1	2	11	**22**	3	5	**15**	**37**
Leave 10 -16 %				**53**			**24**	**78**
Total employees				**253**			**111**	**379**

The table shows that the total manpower needed for the Harbour Master office and the Marine Services comes to about 380 people. The workshop for the floating craft is estimated at an additional 50 people.

9.4.2 Business Development:

Port business development and marketing will be of utmost importance in view of future port development. The circumstances change frequently and they will have impact on the future position of the port. Therefore, the business plan has to be updated frequently and should lead to a rolling plan for the long term including a programme for the medium and short term. A special department could be set up to carry out this activity.

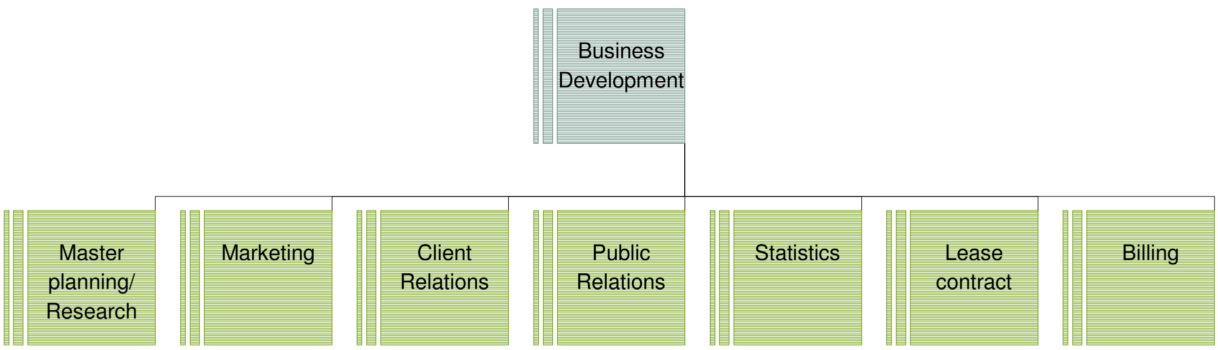
The main aim of the Business Development & Marketing Department in a landlord port situation is facilitating port trade and traffic in all its aspects. In other words, the Business Development & Marketing Department interacts permanently with all port clients and stakeholders to maintain and improve the commercial attractiveness of all port location factors. Important location factors are, for instance, the tariffs, hinterland connections, labour wages, education and flexibility, available space and prices of the port sites for new investments, modern housing and cultural facilities in the region, etc.

The Business Development & Marketing Department is the most important day-to-day interface between (potential) clients and the port administration. It should be the one-stop-shop for all commercial port clients. The main activities of this department are:

- Market research and monitoring,
- Trade facilitation in cooperation with port users,
- Client relations and promotion,
- Reception and guidance of potential, new and existing clients,
- Public affairs
- Concluding contracts
- Billing.

The organization structure of the Business Development Department is in the scheme below.

Figure 9-3 Organisation Business Development Department



Master Planning and Research

The Business Development & Marketing Department is responsible for a good understanding of the port's businesses and the present market position of the port for all different commodities and in all its aspects. One of its objectives is to develop the port in order to attract new clients and operators. In this context master planning should be a continuous activity in order to explore the extension of the port's capacity.

Port Marketing

The difference between port and terminal marketing is that port marketing focuses on the port location factors, which are the same for every port user whereas terminal marketing promotes the advantages for a company to use a certain terminal. The idea of having a Port Promotion Council is that the port users will be unified in a council, which can discuss all kind of collective port opportunities and try to realise them by collective action by, for instance, the organisation of trade missions, terminal security issues, waste collection, fire brigade, utility sharing. and disciplined labour, harmonious industrial relations availability of labour at low cost in the vicinity of Visakhapatnam.

Related to the ‘one stop shop’ idea is the fact that the port administration has a lot of interactions with the national and regional governments for issues such as hinterland connections, spatial and environmental permits, labour issues, etc. These issues do have a strategic impact on the port location factors. For this reason, the public affairs activities, such as information sharing with the governments, lobby, etc should be interrelated with the Business Development & Marketing.

The Department should invest in a well functioning commercial and public network of contacts and a commercial information system (leads, communication with clients, proposals, etc.) in order to detect new trends, potential investment opportunities, new legislation effecting the port’s business, etc.

Client relations

The existing clients of the port such as the refinery, alumina, iron ore, coal, chemicals, and other terminal operators have to be monitored in order to judge the port–client relation and to investigate the actions to be taken.

Contracts

The contract department will be responsible for the legal contractual matters, the conclusion and monitoring of the contracts to be concluded by VPA for the lease of the land, the concessions for the terminals.

Billing

As the operations department will concentrate on the in house terminal operations and the business development department will be the front end for the port user it is suggested that the billing rest with the business development department. The state of the art billing system needs to be installed which can electronically collate all the billing transactions from the various functions including marine, vessel, cargo and container and all other miscellaneous services. The interface needs to be developed with the finance for the purpose of account.

Public relations and promotion

The Department is responsible for putting and maintaining the name of the port on the international map. This requires the preparation and maintenance of proper marketing information, tools and channels by means potential new clients will find their way to the port and by means existing port users can see what is going on in the port. Examples of port marketing are:

- Port map
- Port website
- News letter (digital and on paper)
- Port Handbook
- Organization of trade missions
- Participation in the Port Promotion Council

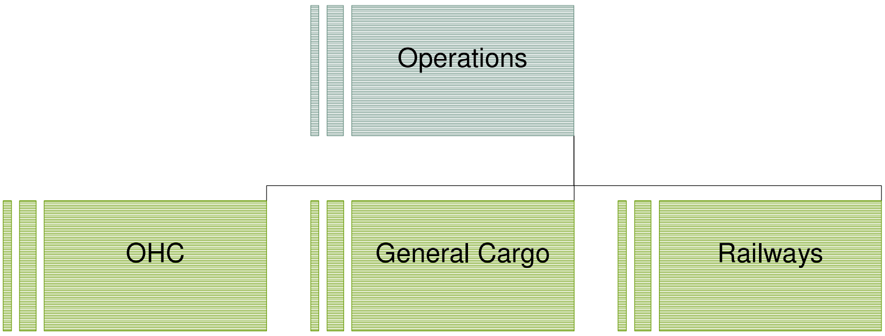
Statistics

Information is one of the most important tools of the Department. Adequate information system and the compilation of port statistics are essential for the internal purposes (planning and research) as well as for the promotion of the port. Moreover the port has to meet its statistical obligations, nationally as well as internationally.

9.4.3 Operations Department

As stated in the previous section the present operations department (Traffic department) will bring in many changes. It is expected that this department will act as one of the terminal operator for the port with the only difference that it will be in house. The operations will include the railway operations. The proposed structure of this division is depicted below.

Figure 9-4



As it is observed that the operations will now focus only to the business units that will be created for the Iron Ore Handling, General Cargo as far as these activities are not yet privatised, and the Internal Railways.

9.5 Tariff and discount policy

9.5.1 Existing Tariff System

In pursuance of its economic reform policy Government of India laid stress on liberalization. Private sector was allowed entry into the major ports to provide services often in competition with the Port Trust themselves. In order to ensure that there was no unfair competition the 1996 guidelines provided for the establishment of the Tariff Authority for Major Ports (TAMP) to fix and revise port tariffs.

The tariff structure of Visakhapatnam Port Trust as any other major port in India is divided in three parts.

- Vessel related charges: The vessel related charges of the port covers the charges for the services directly rendered to the vessel. Some of the charges are of a statutory nature, thus starts running once the vessel touches the water limits of the port, while others are related to the specific services given by the port. This includes Port dues, Pilotage, Berth Hire, Roadstead charges and Transhipments.
- Cargo/Container related charges: it essentially includes Wharfage, Storage fees and Cargo Handling.

- Other charges: There are many other services provided by the port trust and includes Railway, Equipment, Fishing harbour, Licences, Dry docking etc.

The coastal vessels enjoy benefit of charge which do not exceeds 60% of normal charge for vessel as well as cargo/container related charges. Coastal vessels are issued licences by the Director General (D G) of Shipping. The foreign flag vessel can also enjoy coastal charges benefit for specific run once so certified for coastal conversion by D G Shipping and by Customs.

The Authority is presently following a cost plus regime of tariff regulation. The Port will have to investigate closely the economic value added to its user and arrive at a matrix comparing the cost plus versus economic value added component. It is obvious that one needs to travel finally to the regime of competitive pricing where competition and free market determine the tariff levels.

9.5.2 Tariff structure

The tariff structure in ports and specifically in all major ports in India has become more simplified. The port users are, however, are still confused by the complex tariff structure. There is an increasing desire on the part of port users for greater transparency in the billing of port services. This highlights the need for more easily understandable and comparable tariff structures. Ports are increasingly required to review their competitive position against neighbouring ports. The commercial reality in the era of globalization is that customers require a balance of cost and service. Cost approach, the impact of exchange rates, capacity to adjust rates, the impact of privately operated ports and the price setting approach of ports and framework given by regulatory authority like TAMP in India are all vital factors to be investigated.

The objectives in developing pricing are primarily to ensure efficient utilization of the resources, to recover sufficient revenues to meet the financial objectives and to retain the benefits resulting from the investments. The objective from port user perspective is a trade-off between ports tariff and value added. In no case can the cost of value added exceed the benefit port contributes in the value chain. The tariff structure shall thus be simple and clear, and offers a comparable basis among ports. Approaches to achieve simplification include reducing the number of charges and/or reducing the number of variables in the basis of each charge.

The tariff structure for major ports in India follows the ‘Cost Plus’ regime. Whenever the port decides to add a tariff item, it is required to submit a proposal to TAMP for approval. This proposal has an emphasis on the cost estimates the port has to bear in order to handle the cargo. TAMP assesses the submission made by the port and also involves the port users for comments and suggestion. This process has little or no consideration on neither the market forces nor the value added to the port user, and is resolved in isolation.
Consultants have compared the tariffs of Visakhapatnam with the following ports.

1. Major Ports:
   a. Paradip Port Trust
   b. Chennai Port Trust
   c. Calcutta Port Trust
   d. Visakhapatnam Sea Port Private Ltd. (VSL) a BOT terminal in VPT

2. Non Major Ports:
   a. Gujarat Maritime Board (GMB)
   b. Mundra Port
   c. Gujarat Pipavav Port Ltd.

For the purpose of comparison, the following charges and services offered by the port are considered.

1. Port dues
2. Pilotage and towage
3. Berth hire charges
4. Wharfage on selected cargos
5. Free period for cargo storage
6. Demurrage on cargo storage

Annexes 9.2 and 9.3 include a comparison of the essential charges of Visakhapatnam Port Trust with international ports as well as the non-major and private ports. The scale of rates for all major ports is published where as that of non-major and private ports are not transparent.

Today major ports not only have to compete in services and the handling cost with the other major ports but also have to bring in the intelligence from the non major private ports and international ports especially with those connected globally. The idea is to compare the cost incurred as well as the market forces. Major ports will have to constantly review this to ensure retention of captive cargos and also to attract the non captive ones.

9.5.3 Other tariffs in the port

The dock labour board of Visakhapatnam is still a separate entity and there are plans to merge the dock labour with the port. It is however not clear if this merger will result in integration of stevedoring operations by the port authority. Except for the port tariff, the end customer also have to pay for stevedoring, clearing and forwarding, custom duties and in some cases clearance from the income tax for the income on chartering. As far as customs duty and IT related charges do not differ among the ports in India, while stevedoring and the clearing and forwarding do differ.

The stevedoring charges will vary from commodity to commodity as the labour requirement and the incentives to be paid to workers will differ. Comparison can be made for an example with steel cargo where the average rate for stevedoring at Visakhapatnam port is Rs. 75 to Rs. 80 per ton, which includes the levy and piece-rate paid to the dock labour board workers. Compared to Chennai, the charges are relatively low, as the piece-rate and the levy itself is higher in Chennai. However, comparing to a private port like Kakinada it is higher as the workers employed there are private and cheaper compared to that at Visakhapatnam.

The clearing and forwarding charges are usually charged on the value of cargo and it varies from 0.2% to 0.4% of the cargo value. These charges are other than actual charges paid as port and customs charges. The C&F charges are often negotiable and have bearing on volume and future business with the shipper and consignee.

9.5.4 Recommendations

The following recommendations for the tariffs in the Port of Visakhapatnam are given:

1. Some of the international ports like the Port of Rotterdam have the concept of charging the berth hire charges on the basis of length of quay utilized, irrespective of the size of the ship. These charges also vary from quay to quay as the cost and facilities differ for every quay/berth. It is therefore recommended to evolve a similar case for Visakhapatnam.
2. More slabs in the port dues should be introduced to reflect the move to bigger vessels. It recommended to at least differentiating the port dues for inner and outer harbour. The purpose can still be achieved as larger size (cape size) vessels are expected at outer harbour.
3. The wharfage on crude and POL is charged uniformly irrespective of the safety standards provided for the cargos having flash point very low as 23 degrees Celsius. Visakhapatnam shall leverage on the flash point of cargo handled and shall differentiate the charges as safety compliance differs for handling cargo of such a lower flash point.
4. The higher wharfage on coal and fertilizers at Paradip is due to mechanization, though the charges vary with the conditionality but VPT can use this to analyse the base charge, competition and projected cost and revenue.
5. Looking at the paucity of space, the blanket 30 days free time for all export cargo storage shall be reviewed.
6. Cost-based approach is refined to the extent possible by incorporation of performance standards and productivity norms.
7. Port shall work out 'Efficiency Linked Tariff Scheme (ELTS)' introduced in some of the port trust. In this, incentives for good performance and penalties for poor performance need to be built into the scale of rates.
8. The tariff rate set by the regulator act as the ‘ceiling’ rate, port shall use this flexibility, and port officials shall be trained to use this discretion without attracting the audit objections. TAMP provides the flexibility for the port to charge between minimum and maximum limits. To be competitive it is required that the port shall keep on reworking the cost elements as and when modernization (in cargo handling) takes place and accordingly tariff revision should be done. In order to enable the port to do this, the port should adapt Activity Based Costing and the port officials should be trained to work out competitive tariffs. Officials shall also be trained on TAMP guidelines for costing.
9. The regulator had been setting tariffs for the major ports on the understanding that they were not subject to income taxation. Now that port trusts have also come under taxation, the port trusts shall raise this cost item for admission.
10. No major port in India is purely working as of now as landlord port. This results in a single port where there are private operators as well as port authority engaged in the operations. This brings the major port in the competitive scenario within its jurisdiction and hence requires regulatory authority. As soon as port changes into the purely land lord model the port authority itself can act as the regulator.

9.6 HRD

9.6.1 Rationalizing Manpower

In order to arrive at the proposed organization structure port authority is recommended to hire the services of the HR experts who will help in change management. The new organization set up shall be officer oriented.

Rightsizing shall involve shading the flab by downsizing the unwanted resources and infuse the right stream of skills. Port shall identify the resources that are willing to upgrade their skill to handle modern technology. Port can also share the existing resources with the terminal operators. It is also to infuse the right skill set within the organization, matching the requirements of proposed port model. Port shall invest on resources involved in decision making and can monitor and control the prime activities.

As lot of business processes and the documentation will be computerized the skill set required to work in this particular environment shall be trained or infused. More of control functions will be required to do decision making by using ‘Executive Information System’ by the middle management and ‘Management Information System’ by the top management.

9.6.2 VRS schemes

Recognising the high degree of overstaffing at Indian ports, the GoI introduced a Special VRS Scheme for Officers, employees and workers of Port Trusts/DLBs in 1991. The Scheme was intended to attract the surplus persons to opt for voluntary retirement as it was considered that such a situation existed in the Ports. This Scheme was continued till 2000. The VRS was reopened in August 2003, with relaxation of certain conditions. As a result, around 2,200 employees/workers opted for VRS. Overall, manpower at major ports has declined from 69,464 at end-FY2004 to 65,962 at end-FY2005.

The Special Voluntary Retirement Scheme (SVRS) being offered at the major ports has in general following guidelines:

- Eligibility criteria: employees who have completed 10 years of service OR 40 years of age are eligible to apply for SVRS, this is to attract even the young employees to opt for the change.
- Compensation: this as commonly known as the golden hand shake amount is to compensate the employee for taking such decision. The compensation depends on the years of service completed as well as the years of service balance. Compensation generally paid in major ports is one and a half month salary for each year of completed services OR salary for the balance months, which ever works out less. The components in the salary here are only basic and the dearness allowance.
- Benefits to the employee opting for the SVRS:
    - The compensation worked out as stated above is tax free to the extent of Rs. 5 lakhs.
    - Employee avails the pension depending upon the number of years of service he has completed.
    - The terminal dues that is sum of provident fund, gratuity and the leave encashment of the balance earned leave is completely tax free.
    - Employee continues to enjoy the leave travel concession once in four years of block period in the same class as he was entitled for before opting for SVRS.
    - Employee is also eligible for one time travel and transport for the luggage to the place he would like to settle down after SVRS and this is as per the grade of the employee.

The compensation for the SVRS varies in each sector there are public sector undertakings and banks who offer two months salary for every completed year of service. The other way to decrease the work force is the roll back of retirement age. This was done in some ports where the retirement was first shifted from 58 to 60 and again rolled back to 58. The retirement age however can be further reduced.

The right sizing shall be targeted with the mix of skill and thus multi skill shall be encouraged. The gangs working on board shall be trained to work on shore as well and vice a versa. As lot of business processes and the documentation will be computerized the skill set required to work in this particular environment shall be trained or infused. More of control functions will be required to do decision making by using 'Executive Information System' by the middle management and 'Management Information System' by the top management.

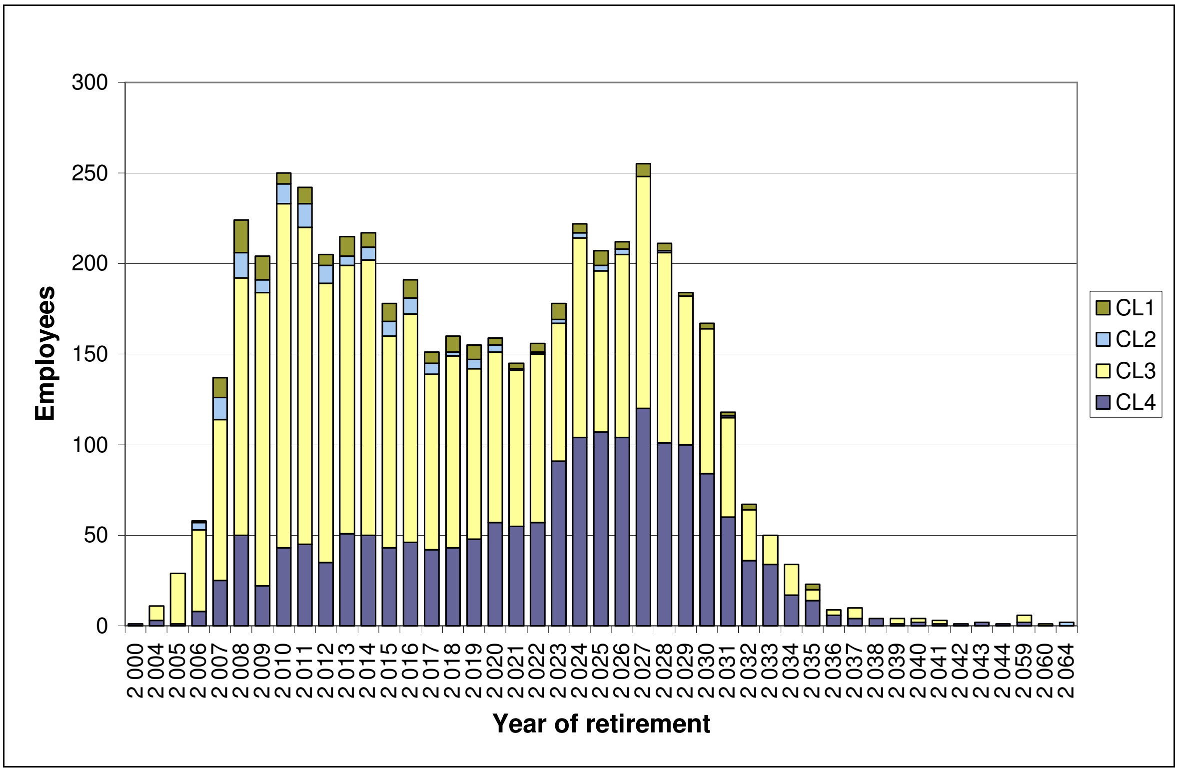
The table below depicts the snapshot of manpower in each department including their share for wage bill and the average age. The major share in terms of employees as well as the wage bill is of engineering services, incidentally the services which are more outsourced. The average age of the employees is more or less similar in all departments and is on the higher side. A majority of the employees being on the higher age bracket are nearing the superannuation taking retirement age of 58 years.

Table 9-2 Departmental strength and wage bill

Department	No. of employees	Share of total employees	Annual wage bill (Million. Rs.)	Share of annual wages	Average age
Administrative Services	85	1,7%	8	1,9%	45,8
Engg. Service Management	1958	38,7%	164	39,6%	46,2
Finance Management Services	155	3,1%	15	3,5%	45,3
Health Care Services	389	7,7%	32	7,6%	46,1
Human Resource Management	75	1,5%	7	1,8%	46,4
Knowledge Management Technology	46	0,9%	5	1,1%	46,9
Marine Operations Management	724	14,3%	56	13,4%	43,5
Materials Management Services	123	2,4%	10	2,5%	44,9
Port Operations Management	849	16,8%	65	15,7%	41,9
Port Planning & Management	659	13,0%	53	12,9%	44,6
Grand Total	5063	100,0%	416	100,0%	44,8

The chart below depicts the superannuation trend among the employees. It is observed that from the year 2008 to 2030 every year on an average 200 employees are superannuating. The trend also display that the retirement of class IV is at the later years compared to class III staff.

Figure 9-5 Chart showing class wise retirement profile of existing employees



Charts showing retirement profiles department wise and class wise of the existing strength and the department wise and class wise annual salaries are annexed at the Appendix 9.4.

9.6.3 Labour Manning and Piece Rate Earning

The manning scale shall be designed for different commodities of cargo for on board as well as on shore. In case of general cargo due attention shall also be given to the cargo description within the commodity. For example in the case of steel cargo, the manning scale for coils has to be far less than the manning for cargo other than coils like steel plates and angles. The practice of notional booking to be obviated in dialogue with the union taking support of the recent guidelines of ministry in the tribunal award.

The cost of labour wages, including the piece-rate, shall under no circumstances, exceed the labour component of wharfage cost. In some cases it is observed that it does not only exceed the labour component but surpasses the complete wharfage earned by the port. This is disastrous and needs immediate attention on piece-rate payments design. The datum have to be defined every year by moving average method, where in the piece-rate for any year shall be based on new datum, which shall be not less than 80% of average output of last three years. The outdated incentive structure shall be replaced by the recent tribunal guidelines stating scales for different types of cargoes and crafts.

The workforce shall be trained for multi-skill operations. To start with, they can be trained in the skills of handling cargo on board and on shore. The workers shall also be trained for handling automated systems as well as computerized business workflows.

9.6.4 Proposed policy for VPT

Consultants have taken in view the ideal situation for the port in future as a land lord port. This will envisage privatizing the terminal operations, and also some of the support services like medical facilities. However some of the activities like handling general cargo at some of the berths in the inner harbour will still rest with the proposed port authority and in such cases, the port authority will be considered as an in-house terminal operator.

In view of above facts consultants have suggested a very lean To-be organization set up. The functions the proposed port authority shall undertake and the role and size of human resource in each department is detailed in the previous section. The most difficult task for any organization in such scenario has been 'Change Management'. The transition from the present state to the To-be state is very strategic and needs involvement of experts. Following steps are suggestive and can materialize gradually.

1. The analysis from the superannuation profile of all the classes of the present employee base is self explanatory. It is seen that majority of class III employees superannuates in few years to come while in case of Class IV it is not so. It is therefore suggested to offer voluntary retirement restricted for class IV. Such turnover shall be planned during the period of say one year, the time by when the proposed projects are on the verge of going live.
2. It is suggested to make a proposal to the Central Government to roll back the retirement age so that the superannuation of the class IV employees also matures in natural course.
3. From the analysis it is seen that Class III and IV staff are skilled work force, especially with engineering services, medical etc. Such personnel shall have the option of joining the private operator and their employment shall form part of the contracts.
4. The proposed port authority will need personnel who are skilled in negotiations, contract management and legal affairs. The Port management has the option of either identifying personnel on the rolls, who have the necessary skills and groom them to take up the identified roles by providing them the required trainings. Alternatively, the management can employ experts in the areas on a retainer basis.
5. The port authority will need to work overtime to retain talent in order to be able to provide better service to its customers. This will require greater emphasis to be laid on Human Relations. The HR department will need to be strengthened in order to provide the required support to the employees. The HR personnel will look after employee welfare, performance management, skill management, employee engagement and other support functions.
6. The employees will need to be trained in the latest technological and management developments in the areas of port management. This implies greater emphasis on training. The training cell will need to be staffed with qualified personnel who will pro-actively plan and arrange for training of the employees.
7. Consultants perceive the future organization structure of the port to be officer oriented with the officers having good skills in the usage of computers and well versed with the state of the art IT systems. The Port Management should analyse from among the present staff the employees who are open for such challenges and shall provide the training to up grade and sharpen the skills required to run the future organization.
8. It is recommended to hire the services of HR experts who can champion the change management.

In view of the future port model and the looking at the retirement profile of the existing strength Consultant would give the following recommendations:

- Reduce the class III and the class IV strength by offering SVRS, the scheme shall be attractive and beneficial to the employee, the normal eligibility, compensation and benefits are discussed above.
- There shall be no further recruitment in class III as well as class IV.
- Interested class III, II and I employees shall be trained to take higher positions and responsibilities. They shall be trained to work with systems and procedures according to international standards.
- Organization has a need for new disciplines for business development, port promotion and marketing.
- The change management and particularly the transition phase will be very critical and thus it is recommended to have on board experienced advisors in a temporary position to shape the new organization structure.

9.7 Information Technology projects

9.7.1 General

VPT has undertaken an exhaustive project for revamping Information Technology Systems. The information technology project includes components like communication network, computer hardware, system software and application software. Out of these first three components are completed already. Phase – I of Application Development, which is planned in two phases, is completed while Phase – II is yet to be started.

Description of benefits
The IT systems help realising the following benefits:

- Computerisation of the management activities and operational activities
- Data capture at source and avoiding data duplication
- On-line processing platform
- Streamlining the operational systems
- Accurate and accelerated processing with ease of working
- Prompt retrieval of required data
- MIS generation

9.7.2 Port Community System (PCS)

IPA is in the process of establishing a centralised and uniform Port Community System covering all its major ports, as a part of its collaborative and co-operative approach to EDI implementation. The proposed system will link (through the internet/portal) all members of the Port Community. The port community includes Exporters, Importers, CHA, Shipping Lines, Shipping Agents, Stevedores, Transporters, Banks, Customs, Railways and other organisations in the maritime logistics chain.

IPA has already started the development of PCS and expected to be completed by 2008. Once PCS is in place, major ports are required to integrate its system with PCS. Apparently there is need for VPT to integrate their IT system with IT Systems of Indian Railways (FOIS – Freight Operations Information System) and Indian Customs (ICEGATE – Indian Customs and Excise Gateway) as this would avoid a lot of data entry efforts at both ends and errors arising out of this. Also document upload functions offered on VPT portal would enable basic documentation such as IA, EA, IGM etc. required to be completed through internet which would help in reducing paperwork and time.

An evaluation of the ports' readiness to integrate with the PCS must be undertaken in order to avoid the delay in implementation. For example the electronic message within PCS relevant to VPT should be identified and the necessary changes required from switching over from proprietary messages /documentation to standard / UNEDIAFCAT messages should commence so that the integration with the PCS is achieved on time. The registration of the port users as mentioned above with the port trust, customs and other regulatory authorities should be unique. The exercise in this regard should be initiated to facilitate the timely integration with PCS.

9.7.3 Management Information System

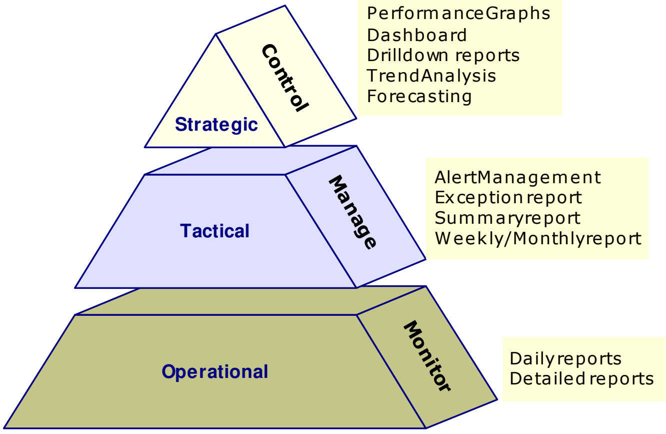
The reports generated by different systems at the port do not help the managers in analysing the root cause quickly. They have to refer multiple reports, often not available from one source, to conclude. Thus, it is difficult for them to take an appropriate and timely action in the field on day-to-day basis.
Therefore, a good tool that will display them what is going on in the field in both quantitative and qualitative terms is necessary. The proposed MIS can help the managers right from the performance measurement, alert management (using dashboard) to trend analysis and forecasting (regular or query based reports).

Benefits of MIS

A well-designed MIS can produce a number of organisational benefits. Some of these include:

- **Faster decision-making** through provision of timely information. There will be no need to wait till the data is processed again to churn out the required piece of information.
- **Better decision-making** control through provision of relevant information. This is very significant because details will be available to substantiate decisions.
- **Improved inter-departmental communication**, which results into reduction in the number of paper records that have to be held by each department.

Figure 9-6 MIS Levels and Information Requirement



9.7.4 Other focus areas for computerisation

Consultants have identified the focus areas for VPT apart from above areas:

- Control room for monitoring vessel operations, rail and storage/stack yard operations. Tracking of wagons/rakes using RFID technology can be explored
- Traffic department to share the functionality of control room related to berth allocation
- Marine scheduling - pilots, tugs, mooring gangs, vessel movements in conjunction with berth allocation
- Activity based costing in order to have substantiated in puts for revising the tariff as well monitor the cost activity wise
- E-tendering / procurement for materials management
- Work flow management – this will help reducing the paperwork and also reduce man efforts
- Document Management System making available all important document online
- Project planning and management – to plan various projects and monitor against planned vs actual efforts in terms of manpower, material and timelines
- A powerful Management Information System drawing inputs all IT systems and providing information necessary for decision making for the management

Costs of implementation

Table below provides cost of implementation and proposed time frame.

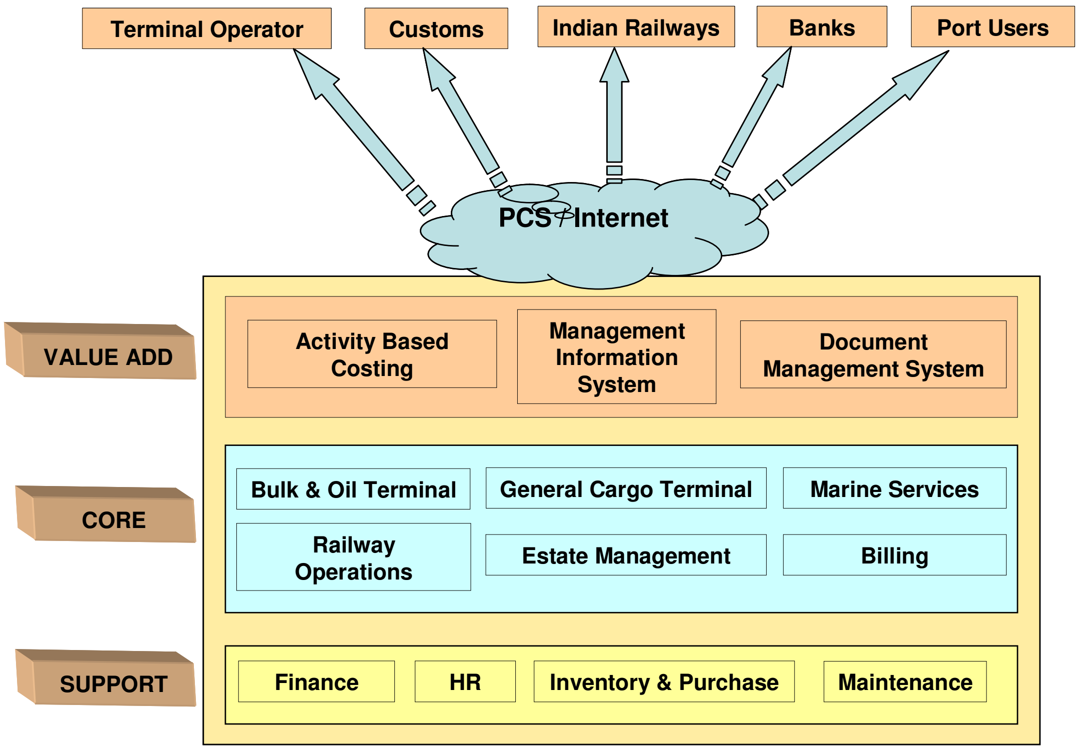
Table 9-3 Cost of implementation and proposed time frame

Project/sub project	Cost of implementation (Rs. Crore)	Time frame
Applications development Phase – II	2.5	2007-08
Applications suggested and not covered in phase II	16	2007-08

9.7.5 Recommendations

Consultants recommend that VPT should develop its IT system in line with the following architecture.

Figure 9-7



IT Implementation - next step

The proposed IT department of the new organization structure is very lean. It is expected that the department is officer oriented and have high skills of modern technology. Major contribution from this lean department is to monitor the contracts with IT vendors and ensure usability across the organization.

The prime area would be to establish the extended arm of the IT department, to have an IT partner in place who will manage the complete program. This IT partner shall organize requirements engineering, implementation plan and the support system.

Requirement Engineering

This phase will help to draw the IT roadmap of the organization. The IT strategy blue print is established and the core business as well as support functions requirements are established. This phase will prescribe the milestones of the implementation. IT partner can help bringing in best practices with roll out of standard products and also for be-spoke development for customization.

IT Implementation

Synergy shall be drawn between the existing systems and the one which are to be rolled out. Implementation strategy shall focus on leveraging benefits from low hanging fruits and to meet the operational requirements at first stage and than the value add requirements.

IT support

Once the required systems are in place they need to be supported up end running all the time, there shall be plan for business continuity and disaster management.

10. FINANCIALS

10.1 Introduction

The main objective of the financial assessment is to come to a coherent, consistent and integrated analysis of the future operating costs, the revenues and impact of the investments proposed. As was stated in the ToR for the project, the Port Trust has to be financially self sustainable in the coming planning period. Investments have to be self financed or by the involvement of the private sector. The policy of VPT is aimed at further implementing the land lord principle, which implies that VPT will be responsible for the nautical activities and the investment in the basis infrastructure. Investments in the new terminals will be given in concession to private operators, who will pay concession fees or royalties.

For this purpose, a financial model has been developed and will be the basis for future annual updates of the business plan. The basis for the model for business planning takes as a starting point the financial accounts of VPT for the years 2003/04-2005/06. All prices and costs are given in prices of 2005/06 which implies that inflation is not taken in consideration. The reason is to present figures with a real value. The profit and loss account and the balance sheets will be summarised in paragraph 10.2.1 and 10.2.2 and a calibration for the years 2004/05-2005/06 has been carried out.

The financial assessment considers the Port Trust as a whole.

10.2 Current situation

This section gives an overview of the current financial situation of VPT by presenting profit and loss accounts, balance sheets and financial indicators for the years 2003/04-2005/06. This overview will be used as starting point for further financial assessment (see further).

10.2.1 Profit and loss accounts

The profit and loss accounts of VPT for the years 2003/04-2005/06 are presented in Table 10.1

Table 10-1 Profit and loss accounts for the years 2003/04-2005/06 (in Rs. Cr.)

	2003-04	2004-05	2005-06
Revenues:			
Cargo Handling & Storage	233.9	260.9	273.6
Port & Dock Facilities	133.0	148.9	158.9
Railway Working	66.0	70.9	74.6
Rentable lands & Buildings	21.4	21.1	21.3
Total Revenues	**454.3**	**501.8**	**528.4**
Less:			
Employment	163.1	174.1	168.02
Stores	13.8	13.6	21.8
Repairs	18.9	19.2	18.3
Power, fuel, lubricants	27.7	32.3	35.1
Dredging	7.3	6.9	7.0
Other operational expenses	19.5	17. 8	21.38
General expenses	9.9	12.0	9.5
Total operating costs	260.2	275.9	281.1
EBITDA	**194.1**	**225.9**	**247.3**
Depreciation	26.9	28.4	31.2
EBIT	**167.2**	**197.6**	**216.1**
Plus: financial & miscellaneous income	11.1	14.6	14.4
Less:			
Interest	1.4	1.2	1.1
Extraordinary results	6.9	0.6	-1.0
Pension fund	60.0	180.0	0.3
Taxes	32.3	19.9	50.48
Net Income	**77.8**	**10.5**	**155.1**

Source: Administration reports VPT

Total revenues for the port as indicated, have risen to Rs. 529 Cr., of which Cargo Handling and Storage accounts for 53%, or Rs. 279 Cr. Total employment costs have been held fairly constant through lay-offs and retirements, despite increasing wages. It should be noted that the employment costs are indicated here as total costs, covering regular salaries, bonus payments, pension contributions and other staff related payments.

With respect to the results, the following observations can be made:

- Straight salary and wages make up around 50% of total employment costs. Together, employment related expenditure is 62% of total operating costs.

- Repair and maintenance expenditures are below 10% of total operating costs and amount to around 4% of the book value of the physical assets, which is well in line with other ports internationally.
- Expenditure for power, fuel and lubricants is rapidly rising, despite the constant efficiency measures targeted. Rising commodity prices for power generation are undoubtedly the major cause of the increase in this cost item.
- EBITDA has risen to over Rs. 230 Cr. from just over Rs. 150 Cr. in 2002-03. The increase is entirely due to the increase in revenues, combined with static total operating costs.
- Depreciation, at around 3% of historical purchase prices, amounts to around Rs.30 Cr.
- EBIT has risen to over Rs. 200 Cr.
- Financial items are having a large impact on the bottom-line net income. This is due to backstopping of the Pension Fund. Once these payments are fulfilled, net income can be expected to rise rapidly.
- Currently, net income for 2005-06 is around Rs. 155 Cr.

In general it can be stated that the financial position of VPT is healthy and the Port can add sufficient funds to its reserves. However, backstopping of the Pension Fund to the amount of around Rs. 450 Cr. will have to be undertaken and this can have significant impact on the cash flow of the Port for several years.

10.2.2 Balance sheets

The balance sheets of VPT for the years 2003/04-2005/06 are presented in the table below.

Table 10-2 Balance Sheets for the years 2003/04-2005/06 (in Rs. Cr.)

Item	2003-04	2004-05	2005-06
Assets			
Fixed Assets	739.4	743.5	738.7
Investments	203.9	198.5	448.5
Current Assets	205.6	231.7	342.0
Deferred expenditure	31.1	25.2	8.8
Total Assets	**1,180.0**	**1,198.9**	**1,538.0**
Equity			
Reserves & surpluses	996.1	1,021.0	1,198.9
Loans	20.1	18.0	15.9
Current liabilities	163.8	159.9	323.2
Equity & Liabilities	**1,180.0**	**1,198.9**	**1538.0**

Source: Administration reports VPT

The balance sheets show that the total assets have grown from Rs. 1,180 Cr. in 2003/04 to Rs. 1,538 Cr. in 2005/06. A substantial increase has taken place in investments/financial means, which are accounted for under the current assets. At the same time, fixed assets have been added almost equal to depreciation values and resulted in a static total fixed assets position of some Rs. 740 Cr.

The loan position as of book-year 2005-06 was very low indeed, at just below Rs. 16 Cr. However, during the current year 2006-07 a new loan has been taken up by the port to finance the rehabilitation of the Iron Ore Handling complex. The amount involved is Rs. 200 Cr., at favourable financial terms. The Yen-dominated loan carries an interest rate of 1.5% and pay-back period of 20 years, but the outstanding amount can be repaid at any time.

Overall, it can be concluded that the financial position of VPT is good and the Port has considerable funds for future expansion as well as substantial leverage possibilities.

10.2.3 Financial indicators and special issues

The table below presents some major financial indicators of VPT for the years 2003/04-2005/06.

Table 10-3 Financial indicators for the years 2003/04-2005/06

	2003/04	2004/05	2005/06
Net margin	17%	2%	30%
Operating ratio	43%	45%	46%
Current ratio	1.3	1.5	1.1
Debt to assets	0.0	0.0	0.0
Revenue per ton (Rs)	101	99	95
Cost per ton (Rs) (excl. financial items, incl. depreciation)	60	61	56
Net surplus per ton (Rs)	16	2	28

Source: Consultant's calculations on basis of data provided

The net margin of the port has increased from 17% in 2003/04 to 30% in 2005/06, while the operating ratio has remained static at around 44%. The current ratio has fallen to 1.1 over the past three years as the current liabilities have increased.

Revenues per ton have fallen from 101 to 95 Rs./ton, but at the same time, the cost per ton has fallen as well, to reach 59 Rs. per ton. The net surplus per ton has increased to 29 Rs. per ton. It should be noted that these values have been impacted considerably by the (non-)payments to the Pension Fund.

At present, VPT shows sound credit rating. The financial strength of VPT makes co-financing feasible. The current debt to total assets ratio is nearly zero as per the balance sheet of 2005-06, and the debt to equity is likewise nearly zero. In capital intensive industries ratios of 2 are common. However, in order to be prudent, a ratio of 1 is reasonable initially.

The estimated cash flows for the years 2003/04 through 2005/06 are presented in the table below.

Table 10-4 Estimated Cash flows (in Rs. Cr.)

	2004/05	2005/06
Net Surplus	10.5	155.1
plus interest after tax	1.6	3.5
plus NCC (non-cash item - Depreciation etc)	28.4	31.2
minus capex	32.8	26.5
Total cash flow	**7.7**	**163.3**

Source: Consultant's calculations on basis of data provided

The Port's cash flows are strong and provide ample room for debt servicing.

10.3 Investments and timing

10.3.1 Overview

The proposed projects together amount to a total capital expenditure Rs. 2,970 Cr. This amount includes also projects that will not be implemented during the current planning period through 2012/13. Of the total amount, around Rs. 1,120 Cr. is for the account of VPT; the remainder is to be covered by private operators.

In 2007/08, an amount of Rs. 170 Cr. is likely to be spent, rising to Rs. 275 Cr. in 2008/09 and then dropping to Rs. 180 Cr. and further to Rs. 45 Cr. by 2012/13

The most important near-term investments for VPT are the rehabilitation of the Iron Ore Handling complex. This project includes the deepening of the entrance channel, the construction of an extension to the existing jetty and the replacement of the major equipment. The project is held by the Port, so that all cargo related revenue will flow back to the port. Furthermore, quay-strengthening projects need to be financed by the Port as well as rail track investments at the GCB. Almost all other waterside-related investments will be undertaken by private operators. A substantial amount of money is required for roads and railway-equipment, Rs. 229 Cr. and Rs. 163 Cr. respectively. Combined, these projects amount to 35% of the investments from VPT funds.

Deepening of the Inner Harbour to cater for vessels with a draft of 14m will only be undertaken as and when sufficient cargo is available. Financing of the project will only be undertaken through private investment or via external funds that require no paybacks and interest from the port. This would in practice mean a government grant.

An overview of the projects and associated annual capital expenditures is given in the table below.

Table 10-5 Projects and associated annual capital expenditure (in Rs.Cr.)

Project	Carry out	Operational	Capacity	Investment (Rs. Cr.)		Annual capex (Rs. Cr)						
						2006	2007	2008	2009	2010	2011	2012
		year	Mt	VPT	Private	2007	2008	2009	2010	2011	2012	2013
Mechanisation export facility WQ1/2 (VPT 23)	yes	2008		22.5	94.3	11.3	11.3	0.0	0.0	0.0	0.0	0.0
Mechanisation GCB (VPT 22)	yes	2009		65.3	171.7	0.0	32.7	32.7	0.0	0.0	0.0	0.0
Mechanised import facility EQ1-3	yes	2015		2.3	74.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iron Ore lengthening (VPT 4)	yes	2012		50.0	0.0	0.0	0.0	0.0	0.0	20.3	29.8	0.0
SBM (VPT 13)	yes	2009	16	0.0	540.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POL/Liquids (VPT 20)	no	2009	10	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Installation shiploader Alumina WQ7 (VPT 10)	yes	2010	2.5	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repairs to WQ-7 (VPT 5)	yes	2008	2	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replacement Equipment I.H. Berths (VPT 24,26)	yes	2008	4.5	58.0	0.0	19.3	19.3	19.3	0.0	0.0	0.0	0.0
Replacement tugs (VPT 27, 30)	yes	2009		40.0	0.0	0.0	0.0	20.0	20.0	0.0	0.0	0.0
New tugs 75T BP (1)	yes	2009		90.0	0.0	0.0	0.0	45.0	45.0	0.0	0.0	0.0
Deepening Entrance Channel / Inner Basin to 14m (VPT 3)	yes	2014		0.0	150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deepening Entrance Channel / Inner Basin to 12,5m (VPT 2)	yes	2008		0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Strengthening E. Quays (VPT 11, 12) to 14m	yes	2014		0.0	120.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Strengthening W. Quays (VPT 6,7,8) to 12,5m	yes	2008		46.5	0.0	0.0	23.3	23.3	0.0	0.0	0.0	0.0
Construction WQ 6 (VPT 9)	yes	2009		0.0	45.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marine services Lova Garden	no	2010		20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construction WQ8 (VPT 15)	yes	2010	5.1	50.0	0.0	0.0	0.0	16.7	16.7	16.7	0.0	0.0
Extension Container Terminal (VPT 16)	yes	2011	4	0.0	120.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Project	Carry out	Operational	Capacity	Investment (Rs. Cr.)		Annual capex (Rs. Cr)						
						2006	2007	2008	2009	2010	2011	2012
		year	Mt	VPT	Private	2007	2008	2009	2010	2011	2012	2013
Upgrading OR1-2 (VPT 19)	yes	2011	3	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Procurement barges and launches (VPT 20)	yes	2010		6.0	0.0	0.0	0.0	2.0	2.0	2.0	0.0	0.0
Road (VPT 32, 33, 34, 37)	yes	2011		229.0	0.0	0.0	45.8	45.8	45.8	45.8	45.8	0.0
Other works (VPT 41, 42, 43, 44, 50 and 45, 49)	yes	2011		61.9	70.0	0.0	12.4	12.4	12.4	12.4	12.4	0.0
Environmental (VPT 46,48)	yes	2012		45.0	0.0	0.0	0.0	9.0	9.0	9.0	9.0	9.0
East Docks (VPT 18), South Side	yes	2009	5	30.0	88.5	0.0	0.0	0.0	30.0	0.0	0.0	0.0
East Docks (VPT 18), North Side	yes	2015	3.5	0.0	88.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mobile Cranes 2*100t (VPT 29)	yes	2007		0.0	45.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construction EQ10 (VPT 14)	yes	2009	2	0.0	35.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mechanised facilities coal handling East Docks South (VPT 25)	yes	2009		0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replacement 2 locos 1430 HP & 1 loco 3100 HP (VPT 28, 31)	yes	2010		34.0	0.0	0.0	0.0	11.3	11.3	11.3	0.0	0.0
Rail (VPT 35, 36, 38)	yes	2011		129.0	0.0	0.0	25.8	25.8	25.8	25.8	25.8	0.0
Shifting Fishing harbour (VPT 51)	yes	2011		85.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Residual costs on VPT 4 (Project 5)	yes	2012		145.0	0.0	0.0	0.0	0.0	36.3	36.3	36.3	36.3
Residual payments (Sheet 16/11/06: VPT1)	yes	2006		13.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0
Liquids lines/Loading arms LPG Jetty	yes	2009	1.5	23.0	0.0	0.0	0.0	11.5	11.5	0.0	0.0	0.0
Total				1,140.5	1,830.2	43.6	170.5	274.7	265.7	179.5	159.0	45.3

10.3.2 Implications

VPT's policy is aimed at further privatisation of the port's activities. This implies that the negotiations with the private operators will be focussed on royalties to be paid to the port, both for the land in use

(Land Lease) and the use of the port for handling cargo. But the revenue shift will take place from wharfage dues, and in some cases berth hire too if and when the operator constructs his own quay.

Port dues, and vessel related charges will remain the privilege of the port, insofar the Marine Services are not privatised.

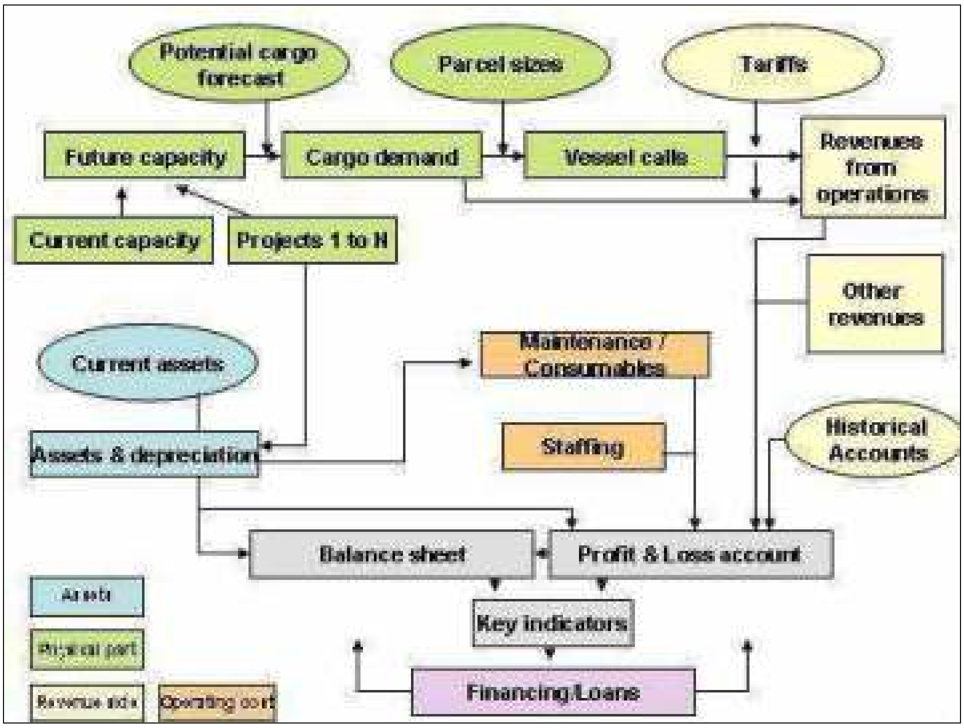
10.4 Modelling assumptions

10.4.1 Model set-up

A model has been developed that integrates the cargo forecast, the current financial position of the port, the planned investments and their timing as well as the prevailing tariffs. The impact of the basic planning program is calculated in terms of the financial situation of the port over a 20-year horizon. The model is flexible and allows for different choices with respect to the planned investments in terms of capacity, investment amount, timing as well as ownership. Tariffs and cargo forecasts are flexible in the sense that percentage deviations from the base situation can be defined and calculated.

The structure of the model is indicated in the figure below.

Figure 10-1 Financial model flowchart



The blocks of the model describe the following elements.

- The green blocks relate to the physical inputs of the model. That is to say, the capacity of the port, the expected demand, the parcel sizes in which the cargo arrives and hence the vessel calls.
- The yellow blocks relate to the revenue-side of the equation. The prevailing tariffs are multiplied by the amount of cargo that the port can handle (in case insufficient capacity is created, then the demand will be capped at the capacity level). And the appropriate tariffs are used for the vessel calls.
- The blue blocks relate to the assets of the port. The existing, or current, assets are depreciated and flow to the balance sheet. The projects that are implemented are added to the assets and depreciated. The additional assets are put on the balance sheet and the depreciation is moved to the profit and loss account.
- The operating costs are in orange. The maintenance costs are taken as a percentage of the value of the assets. Staff costs are calculated separately. Costs flow onto the profit and loss account.
- From the balance sheet and the profit and loss account, key indicators are derived. The available cash is checked against the requirements for the investment program and then it is checked whether loans are required or not. The loan requirements are checked against the balance sheet and the profit and loss in an iteration procedure.

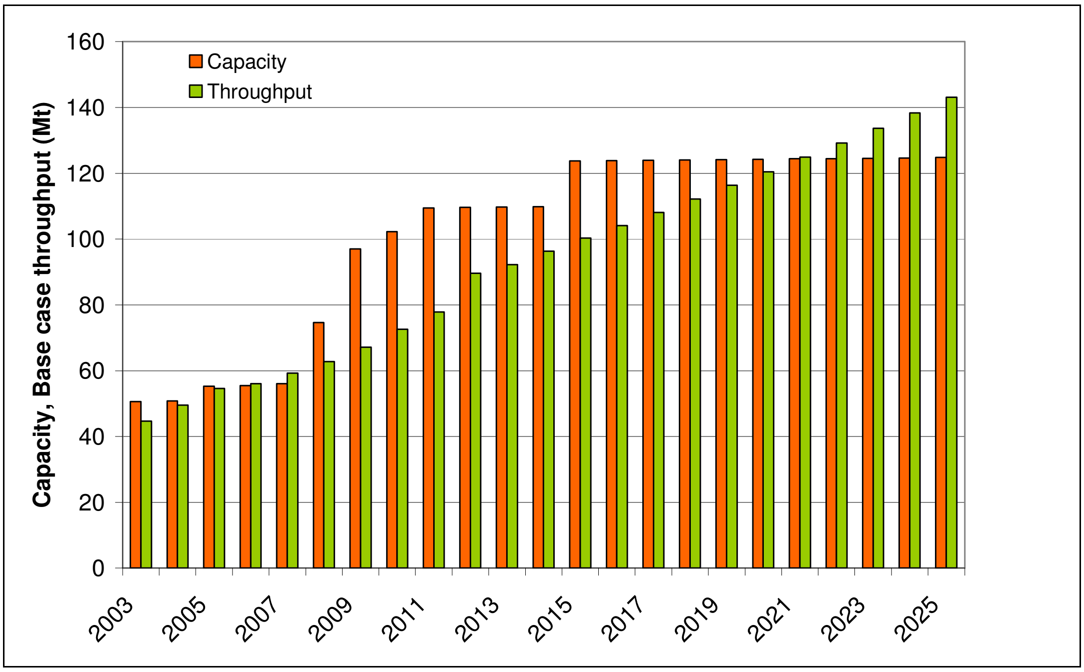
The main components of the model flow are covered in the following sections.

10.4.2 Physical parameters

The physical parameters follow from the cargo forecast section. Investments create capacity, but the timing of the investments may result in capacity shortage. If that is the case, demand is kept at capacity.

For modelling purposes, two different scenarios on cargo demand have been added to the base case presented earlier in the report. A high and low case have been added, each deviating 10% from the base case, which is presented in the figure below.

Figure 10-2 Capacity and Base Case Demand, Mt, 2004/05-2025/26



It is foreseen, that if trend lines continue as they are, by the middle of the next decade investments in new capacity will be required. These investments have not been taken into account in the results presented here.

The assumptions on parcel sizes and vessel-size developments result in a forecast of vessel calls by vessel type. In the base case, the total vessel calls roughly double over the twenty year period through 2025/26, to reach around 2500 (see table below).

Table 10-6 Parcel size and vessel calls by product, 2005/06-2025/26

Product	Avg parcel size	Annual Growth**	2006/07	2009/10	2012/13	2015/16	2025/26
Crude	80	0	94	50	60	68	80
Oil Products	20	5%	39	34	32	30	23
LPG	5	50%	41	75	80	85	123
Other liquids/Chemicals	5	10%	105	147	164	177	68
Coking Coal	36	5%	242	204	196	213	340
Fertiliser / Raw Materials	25	10%	96	102	101	104	183
Limestone	30	0%	16	3	7	10	13
Other cargo	10	0%	100	146	161	177	376
Containers	4	10%	172	387	430	462	281
Oil products	20	5%	99	112	128	138	120
Iron Ore Outer	52	5%	249	251	239	233	273

Product	Avg parcel size	Annual Growth**	2006/07	2009/10	2012/13	2015/16	2025/26
Harbour							
Iron Ore Inner Harbour	40	0%	63	63	63	63	63
Thermal Coal	33	5%	71	68	65	62	60
CP Cokes	30	5%	12	19	24	25	30
Alumina	30	0%	30	83	137	140	267
Other Dry Bulk	21	5%	76	107	112	122	179
Total			1,505	1,851	1,999	2,109	2,479

Notes: * Average crude parcel size switches to 200 Kt when SBM becomes operational. ** Annual growth upto maximum sizes in several cases.

10.4.3 Tariffs

The tariffs are those presently applied by the port. No increases are included, so tariffs remain static in real terms. Furthermore, there is no differentiation in tariffs between coastal and foreign vessels. The tariffs are broken up in the following categories:

- Cargo-related tariffs:
    - Wharfage
    - Handling
    - Storage
- Vessel related tariffs:
    - Port dues
    - Pilotage/towage
    - Berth hire

Handling refers to mechanised handling of cargo, which is not applicable in New Mangalore at this point. Storage income is presently very low and has therefore been ignored in the model.

As the terminals are handed over to private operators under concession deals or BOT deals, the tariffs will change into royalties. For the purpose of the financial model, the royalties have been kept on par with the wharfage tariffs.

Berth hire remains a revenue stream for the port, as quays are built by the port.

The tariffs indicated in the table may deviate from the existing scale of rates. This is particularly true for POL/other liquids and LPG. In the past, other tariffs have been realised than the current (2005-06) rates and in particular growth cargoes that require little investment by the port are likely to be reviewed. In fact, such practice has been observed already. For POL and other liquids a composite tariff has been used, based on the observed mix of cargoes and their relevant wharfage rates. With respect to LPG, the official wharfage tariff of Rs. 136/ton realised in 2005-06, is substantially higher than the rate realised in 2004-05. With the expansion of the LPG throughput due to the opening of the Cavern, the consultants have assumed downward tariff revisions for the purpose of the future financial results.

The tariffs used in the model, for wharfage by commodity, are presented in the table below.

Table 10-7 Wharfage tariffs by product (in Rs/ton)

Product	Direction	Foreign vessels	Coastal vessels
Crude	Import	17	17
Oil Products	Import	40	24
LPG	Import	74	44
Other liquids/Chemicals	Import	74	44
Coking Coal	Import	26	16
Fertiliser / Raw Materials	Import	27	17
Limestone	Import	25	15
Other cargo	Import	25	15
Containers	Import	80	80
Oil products	Export	40	24
Iron Ore Outer Harbour	Export	26	26
Iron Ore Inner Harbour	Export	13	13
Thermal Coal	Export	15	15
CP Cokes	Export	26	16
Alumina	Export	30	18

The wharfage for containers has been recalculated on the basis of the charge per container and the observed mix between empties and full containers (10% and 90% respectively).

The mechanical handling and tippling tariffs for Iron Handling in the Outer Harbour are indicated in the tables below. These tariffs remain applicable and for account of the port, as the project is not envisaged to be privatised.

Table 10-8 Mechanical tariffs by product (in Rs/ton)

Product	Foreign vessels	Coastal vessels
Iron Ore Outer Harbour	36	36

Table 10-9 Tippling and stacking tariffs by product (in Rs/ton)

Product	Foreign vessels	Coastal vessels
Iron Ore Outer Harbour	32	32

The table below presents the vessel-related charges, which have been used in the financial model. These items are Port dues, pilotage dues and berth hire.

Table 10-10 Port dues (by item), Rs/GRT

Item	Levy Foreign vessels:	Levy Coastal vessels:
Iron Ore & Pellets (Mechanised)	8.2	4.8
POL Outer Harbour	12.1	7.1
POL Inner Harbour	10.1	5.9
Other cargo	11.5	6.7

Table 10-11 Pilotage dues (by item), Rs/GRT

Item	Size group (DWT)	Levy Foreign vessels:	Levy Coastal vessels:	Remarks
Iron Ore & Pellets (Mechanised)	<= 40,000	25	15	
	> 40,000	23	13	1 Mln Rs for Foreign vessels + charge per GRT and 0.5 Mln Rs + charge per GRT for Coastal vessels
POL	<= 10,000	14	8	Minimum charge 10k Rs for foreign vessels and 6K Rs for coastal vessels
	10,001 – 30,000	14	8	
	> 30,000	20	12	
Other cargo	<= 10,000	15	9	Minimum charge 21k Rs for foreign vessels and 12K Rs for coastal vessels
	10,001 – 30,000	16	9	
	> 30,000	23	13	

Table 10-12 Berth hire (by item) Rs/GRT/hr

Item	Size group (DWT)	Levy Foreign vessels:	Levy Coastal vessels:
Iron Ore & Pellets (Mechanised)	<= 70,000	0.13	0.08
	> 70,000	0.37	0.21
POL	<= 10,000	0.10	0.06
	10,001 – 30,000	0.43	0.02
	> 30,000	0.07	0.04
Other cargo: Crane berths	<= 10,000	0.21	0.12
	10,001 – 30,000	0.10	0.06
	> 30,000	0.17	0.10
Other cargo: non Crane berths	<= 10,000	0.11	0.06
	10,001 – 30,000	0.05	0.03
	> 30,000	0.08	0.05

The berth hire is determined by the length of the stay at the berth. As mechanisation is introduced, this berth time will fall. The table below indicates the berth time used for the various cargo types. The reduction in berth time coincides here with the realisation of relevant projects. The biggest reductions will take place with the introduction of mechanised handling of coal, where the berth time will drop from 6.9 to 1.3 days and the introduction of mechanised handling of fertiliser, where berth time falls from 5.2 to 1.0 days. Iron Ore handling in the Inner Harbour will fall by nearly two-thirds from 3.2 to 1.0 days.

Table 10-13 Berth time by product, days

Product	Direction	Current	Future
Crude	Imports	1.4	0.9
Oil Products	Imports	2.9	0.7
LPG	Imports	1.4	0.8
Other liquids/Chemicals	Imports	0.9	0.6
Coking Coal	Imports	6.9	1.3
Steam Coal	Imports	2.8	1.3
Fertiliser / Raw Materials	Imports	5.2	1.0
Pet Coke	Imports	5.4	1.3
LAM Coke	Imports	5.4	1.3
Limestone	Imports	4.1	3.1
Other cargo	Imports	1.0	0.9
Containers	Imports	1.0	1.0
Oil products	Exports	1.9	1.3
Iron Ore OH	Exports	1.5	1.0
Iron Ore IH	Exports	3.2	1.0
Thermal Coal	Exports	3.4	2.3
CP Cokes	Exports	5.4	3.8
Alumina	Exports	1.5	1.5
Other Dry Bulk	Exports	4.1	3.1

10.4.4 Costs

The main cost items are:

- staff
- repair and maintenance
- depreciation
- interest

Staff costs, or labour costs have been included in the model on the basis of a top-down calculation. That is to say, overall staff levels have been used, multiplied by an average salary of Rs. 0.34 Mln per year. This salary will be increased by 25% as of January 1st 2007. The average salary is comprised of the basic salary and a 90% surcharge for pension and other allowances. With mechanisation and privatisation, staff will become redundant. An annual retirement rate of 4% has been applied, and a

0.25% normal labour switching rate as per the port's observations. A rehire rate of 40% has been used, in accordance with Port policy.

Repair and maintenance costs (see table below) are taken as percentages of the initial asset value of the equipment for new projects. Maintenance is only applied to those projects in which VPT invests. No escalation is included. Following percentages have been applied:

Table 10-14 Repair and Maintenance costs

Project	%-age of value	Annual cost (Rs.Cr.)	First year of operation
Mechanisation export facility WQ1/2 (VPT 23)	1.5%	0.3	2008
Mechanisation GCB (VPT 22)	1.5%	1.1	2009
Iron Ore lengthening (VPT 4)	1.5%	0.8	2012
Replacement Equipment IO Berths (VPT 24,26)	2.5%	1.5	2008
Replacement tugs (VPT 27, 30)	2.5%	1.0	2009
New tugs 75T BP (1)	2.5%	2.3	2009
Deepening Entrance Channel / Inner Basin to 14m (VPT 3)	0.5%	0.0	2014
Strengthening W. Quays (VPT 6,7,8) to 12,5m	1.5%	0.7	2008
Marine services Lova Garden	1.5%	0.3	2010
Construction WQ8 (VPT 15)	1.5%	0.8	2010
Extension Container Terminal (VPT 16)	1.5%	0.0	2011
Upgrading OR1-2 (VPT 19)	1.5%	0.0	2011
Procurement barges and launches (VPT 20)	2.5%	0.2	2010
Road (VPT 32, 33, 34, 37)	1.5%	3.4	2011
Other works (VPT 41, 42, 43, 44, 50 and 45, 49)	1.5%	0.9	2011
Environmental (VPT 46,48)	2.5%	1.1	2012
East Docks (VPT 18), South Side	1.5%	0.5	2009
Replacement 2 locos 1430 HP & 1 loco 3100 HP (VPT 28, 31)	6.0%	2.0	2010
Rail (VPT 35, 36, 38)	2.5%	3.2	2011
Development Fishing harbour (VPT 51)	1.5%	1.3	2008
Liquids lines/Loading arms LPG Jetty	2.5%	0.6	2009

Depreciation of assets (see table below) is split between depreciation on existing assets and depreciation on new assets. Existing assets are depreciated in line with the observed norms as per the port's annual accounts. The depreciation varies between 0% on land and nearly 8% on plant and machinery. The total depreciation on existing assets amounts to Rs. 33 Cr. per year.

Table 10-15 Depreciation existing assets

Item	%-age of gross block value	Annual cost (Rs. Cr.)
Land	0.0%	0.0
Capital Dredging	1.1%	0.8
Buildings Sheds and Other Structures	2.3%	1.5
Wharves, Roads, Boundaries	2.5%	1.5
Floating Craft	5.2%	7.0
Railway and Rolling Stock	3.3%	2.9
Docks, Sea-Walls, Piers, and Navigational: Aids	1.5%	3.7
Cranes and Vehicles	4.7%	5.9
Plant & Machinery	3.7%	3.2
Installations for Water, Electricity, Telecom. & Fire Fighting	6.3%	5.3
Total		31.5

Depreciation on new assets (see table below) depends on the type of asset, with civil works having substantially longer economic lives than equipment. All are straight line depreciations. The table indicates the depreciation periods that have been applied. The biggest items are the Iron Ore Handling complex and the roads and the tugs.

Table 10-16 Depreciation new assets

Project	%-age of value	Annual cost (Rs. Cr.)	First year of operation
Mechanisation export facility WQ1/2 (VPT 23)	2%	0.5	2008
Mechanisation GCB (VPT 22)	2%	1.4	2009
Iron Ore lengthening (VPT 4)	2%	1.0	2012
Replacement Equipment IO Berths (VPT 24,26)	5%	2.9	2008
Replacement tugs (VPT 27, 30)	4%	2.0	2009
New tugs 75T BP (1)	5%	4.5	2009
Strengthening W. Quays (VPT 6,7,8) to 12,5m	2%	0.9	2008
Construction WQ8 (VPT 15)	2%	1.0	2010
Procurement barges and launches (VPT 20)	5%	0.3	2010
Road (VPT 32, 33, 34, 37)	2%	4.5	2011
Other works (VPT 41, 42, 43, 44, 50 and 45, 49)	2%	1.2	2011
Environmental (VPT 46,48)	5%	2.2	2012
Replacement 2 locos 1430 HP & 1 loco 3100 HP (VPT 28, 31)	4%	1.4	2010
Rail (VPT 35, 36, 38)	2%	2.6	2011
Remaining costs on Iron Ore Handling complex not covered in separate projects	2%	5.8	2008
Liquids lines/Loading arms LPG Jetty	4%	0.9	2009

10.4.5 Existing financial items

In order to arrive at a ongoing financial statement, the model integrates the current accounts of the port as per the 20005/06 book-year. This implies that on several items assumptions have had to be made with respect to their future levels. This applies for:

- Investments on the assets side
- Financial income
- Current assets
- Current liabilities
- Overhead costs
- Existing loans

The investments/reserves have been held static at the current level of Rs. 448.5 Cr. These can however be used for capital expenditure.

The financial income is derived from the investments. The port has provided an outlook through 2012. After 2012, it is assumed that the income will remain static at the then levels of Rs. 15 Cr.

The current assets amounted to a total of Rs. 350 Cr. per end book year 2005/06. Those have been integrated with the currents assets and liquid means. A further assumption is that an inventory is held of 5% of the book value of the equipment and accounts are received after 50 days.
The current liabilities amounted to Rs. 320 Cr., those have been kept static over the forecast period, with variations occurring in two separate items of current liabilities, salaries and accounts payable. The former is set at 1/12 of salaries payable and the latter at 45 days of operating costs.

The overhead costs are predominantly made up of the engineering workshop and other costs. The total costs amount to Rs. 33 Cr. per year. These have been held constant.

The port has loans to a total of Rs. 216 Cr. This is a combination of an existing loan of Rs. 16 Cr. and a loan of Rs. 200 Cr., concluded in book-year 2006-07. Repayment is set at 20 years, but actual payback may be shorter depending on cash availability.

10.4.6 Other general assumptions

Following general assumptions have been made:

- All financial figures are in constant prices, no inflation is assumed.
- Salaries are adjusted by 25% in 2006/07
- Financial implementation of the projects takes place at the beginning of the year
- The retained earnings are put into an investment reservation fund on which it is assumed that 4% interest will be realised. This assumption is used to cover any possible capacity requirements that may arise after the planning period. It is thus assumed that the net income generated from any virtual investment is equal to 4%. This assumption is assumed to be a fair representation of the investment returns on public service investments. Thus, after the current planning period, when no further capital expenditure is foreseen, this is to be covered from these reservations.
- Non-planned capital expenditure is excluded from the analysis. These amounts may be around Rs. 20 Cr. per year, when occurring. As per the previous item, this amount is covered from the investment reservation on the balance sheet.

- Area lease is held constant at Rs. 22 Cr.
- Tax rate is set at 30% and paid in the year of realisation

10.5 Forecast financials

10.5.1 Profits and losses

A forecast of profits and losses is presented in the table below. More detailed information, including projections by year, is contained in Annex ...

Table 10-17 Profit and loss accounts 2006/07-2025/26 (in Rs. Cr.)

	Years								
Item	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2017/18	2025/26
Operating revenue									
Cargo related fees from terminals	246	249	259	250	243	251	290	296	306
Vessel related fees	161	160	169	180	188	195	225	245	263
Other income	83	83	91	97	97	97	113	113	113
Total operating revenue	490	492	520	527	528	543	629	655	682
Non-operating revenues	-	-	-	-	-	-	-	-	-
Royalties	1	1	16	48	72	80	94	122	139
Area lease	22	22	22	22	22	22	22	22	22
Total other revenues	23	24	38	70	95	102	117	144	161
Total revenues	513	515	558	597	622	645	746	799	843
Operating costs	-	-	-	-	-	-	-	-	-
Salaries and benefits	174	209	203	197	191	184	179	153	116
Repair and maintenance/consumables	110	112	122	133	112	123	138	142	132
Other costs	7	7	8	8	8	8	10	10	10
Total operating costs	291	328	333	338	311	315	326	305	258
Non operating costs	23	23	23	23	23	23	23	23	23
Total costs	314	351	356	362	334	338	349	328	281
EBITDA	199	165	202	236	289	306	397	471	562
Depreciation	34	34	38	47	49	58	67	62	42
EBIT	165	131	164	189	239	249	330	410	521
Financial items									
Income	15	20	24	16	19	16	15	73	200
Less: Interest	0	-3	-3	-25	-24	-22	-20	-12	0
Less: Pension Fund	-65	-68	-72	-75	-79	-83	0	0	0
Total financial items	-50	-52	-51	-84	-84	-89	-5	61	199
EBT	115	79	113	105	156	160	325	471	720
Tax	35	24	34	32	47	48	97	141	216
Net income	81	56	79	74	109	112	227	330	504

As the port is privatising its operations, its income from cargo handling will drop over time. As not all berths are yet designated to be privatised, a residual income from cargo handling remains on the profit and loss account. Total cargo related revenues are expected to remain static in the base case at around Rs. 250 Cr. and increase to Rs. 290 Cr. by 2012/13. Note that as royalties and wharfage tariffs are identical, this does not make a difference to the total revenues of the port. Vessel related revenues are forecast to grow steadily from Rs. 162 Cr. to Rs. 225 Cr in 2012/13 and further to Rs. 263 Cr. in 2025/26.

The royalties will take over the function of wharfage dues. With the gradual transfer of operations to private operators, royalties are set to grow from Rs. 16 Cr. in 2008/09 to Rs. 94 Cr. in 2012/13 and further to nearly Rs. 139 Cr. in 2025/26.

Total revenues of the port are thus forecast to grow from Rs. 513 Cr. in 2006/07 to Rs. 746 Cr. in 2012/13 and further to nearly Rs. 850 Cr. in 2025/26.

Repair and maintenance costs are set to rise by 17% through 2012/13 as projects are implemented.

Total costs will rise and then fall over the entire forecast period, hovering around Rs. 300 Cr. as repair and maintenance cost increases are offset by salary reductions and privatisation heaves off costs to private operators.

The EBITDA rises from Rs. 199 Cr. to Rs. 326 Cr. by 2012/13 and can then rise further to Rs. 562 Cr. by 2025/26.

Depreciation increases gradually from Rs. 34 Cr. to Rs. 67 Cr. These amounts are comparatively low, as most assets have long lifetimes.

The tax obligation rises in line with profit, from Rs. 35 Cr. in 2006/07 to around Rs. 97 Cr. in 2012/13 and further to Rs. 216 Cr. in 2025/26

Net income is thus set to grow from Rs. 81 Cr. in 2006/07 to Rs. 227 Cr. in 2012/13 and may rise to Rs. 504 Cr. in 2025/26.

10.5.2 Balance sheets

A forecast of the balance sheets is presented in the table below. More detailed information, including projections by year, is contained in Annex …

Table 10-18 Balance Sheet 2006/07-2025/26 (in Rs. Cr.)

	Years								
Item	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2017/18	2025/26
Assets									
Fixed assets	749	886	1,123	1,342	1,472	1,573	1,552	1,246	1,508
Investments	448	448	448	448	448	448	448	448	448
Investment reservation	124	229	41	105	39	14	228	1,828	4,753
Current assets & Liquid means	351	362	383	397	411	420	429	446	526
Total assets	**1,672**	**1,925**	**1,995**	**2,292**	**2,370**	**2,455**	**2,657**	**3,969**	**7,236**
Equity and Liabilities									
Equity	1,283	1,339	1,418	1,492	1,601	1,712	1,940	3,390	6,846
Loans	16	206	196	419	393	366	339	206	26
Current liabilities	373	381	381	381	377	377	378	373	364
Total equity and liabilities	**1,672**	**1,925**	**1,995**	**2,292**	**2,370**	**2,455**	**2,657**	**3,969**	**7,236**

Source: Consultant's calculations

The balance sheet total of the port rises from Rs. 1,672 Cr. in 2006/07 to Rs. 2,657 Cr. in 2012/13 and can then grow further to Rs. 7,236 Cr. in 2025/26. The increase is built up of additions to the fixed assets, which will increase more than 100% by 2012/13 and then fall again as depreciation outweighs replacement under the current capital budget program. The loans will be paid off by 2025.

An additional loan of Rs. 250 Cr. will have to be taken up by 2008/09 under the scenario assumptions, in order to pay for all investments. The loan is assumed to be paid back over 15 years and carry an interest rate of 9%.

It should be noted that this balance sheet assumes that the retained earnings are kept in the company. This assumption reflects the need for a Landlord port to focus on its Public Service tasks, where significant dredging is required. Furthermore, the Port's long term needs imply expansion either outwards or inwards. As indicated in Chapter 5, a rough estimate of the cost of such expansion inward is Rs. 900 Cr. for the inward option and around Rs. 3,000 Cr. for the outward option. With the reservation fund, the Port will be equipped to undertake such a project.

10.5.3 Cash-flow

The total cash-flow of the port (see table below) will be negative for several years with the two largest negative years in the period 2008-2010 when the bulk of the immediate investments is expected to take place in financial terms.

Table 10-19 Estimated Cash flow, Rs. Cr.

	Years								
Item	**2006/7**	**2007/8**	**2008/9**	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2017/18**	**2025/26**
Net Surplus	81	56	79	74	109	112	227	330	504
Plus interest after tax	0	2	2	18	16	15	14	8	0
Plus NCC (non-cash item - Depreciation etc)	34	34	38	47	49	58	67	62	42
Minus change in NWC (net working capital changes)	-8	1	15	13	12	8	7	-1	20
Minus capex	44	170	275	266	179	159	45	0	379
Total cash flow	78	-80	-171	-141	-17	18	257	401	147

Source: Consultant's calculations

10.5.4 Key-indicators

The key-indicators, as presented previously in this chapter for the historical figures, are shown in the table below. The net margin is expected to remain around 10-13% for the next three years and then increase to 18%, to jump further to 30% by 2012/13. The sharp jump in 2012/13 is entirely due to the finalisation of the backstopping of the Pension Fund by 2011/12.

Table 10-20 Financial indicators for the years 2006/07-2012/13

Indicator	**Definition**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
Net margin	Net income/revenues	16%	11%	14%	12%	18%	17%	30%
Operating ratio	Operating income/revenues	32%	25%	29%	32%	38%	39%	44%
Current ratio	current assets/current liabilities	0.9	1.0	1.0	1.0	1.1	1.1	1.1
Debt to assets	total debt / assets	0.0	0.1	0.1	0.2	0.2	0.1	0.1
Revenue per ton (Rs)		96	96	95	89	86	83	84
Cost per ton (Rs)	(Operating cost + depreciation)/throughput	65	71	67	61	53	51	47
Net surplus per ton (Rs)	Net income/revenues	15	10	13	11	15	14	26

Source: Consultant's calculations

The operating ratio is expected to remain fairly static at around 30% through 2009/10 and then increase to some 44% by 2012/13. The balancing of the operating costs between staff reductions and increased maintenance is translated immediately in improved margins as revenues increase with rising throughput.

The current ratio is also expected to fluctuate around 1.1 over the planning period. However, much hinges on the assumption with respect to the investment policy of retained earnings in this respect.

The debt to assets ratio increases to 0.2 under the base case assumptions, which includes an additional loan requirement of Rs 250 Cr.

The revenues per ton fall somewhat over the years from Rs 96 per ton to Rs 84 per ton as the mix of cargo switches to relatively lower revenue earning cargoes. This is particularly true of the renegotiated wharfage on Crude oil.

The total cost per ton (excluding financial items) increases initially to around Rs 70 and then starts to fall to below Rs 50 per ton by the end of the horizon.

The net surplus per ton is expected to hover around Rs 10 per ton over most of the budget period and increase to Rs 26 per ton by 2012/13.

10.6 Sensitivity analysis

10.6.1 Introduction

In order to analyse the sensitivity of the cash flow outcomes, the assumptions of the model have been adjusted to reflect alternative possible paths of the future. These variations are applied to:

- Cargo throughput, plus and minus 10% from the base
- Investment levels, plus and minus 20% of the estimated capital costs
- Tariffs/royalties, plus and minus 20% of the current values
- Combination of lower throughput and lower royalties.

10.6.2 Varying cargo throughput

The results for a varying cargo throughput are presented in the table below.

Table 10-21 Estimated cash flows for a varying cargo throughput (in Rs. Cr.)

	Years								
	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2017/18	2025/26
Base case cash flow	78	-80	-171	-141	-17	18	257	401	147
10% higher throughput	88	-70	-152	-115	11	48	269	412	157
10% lower throughput	61	-99	-194	-169	-48	-15	218	382	128

Source: Consultant's calculations

A 10% variation of the cargo throughput results in a similar variation in the cash flow on average over the medium term. At its lowest, the cash flow would drop to Rs -194 Cr. However, there are considerable implications for the financing requirements. In case of a 10% higher throughput, the loan requirement would fall from Rs 250 Cr in the Base Case to Rs 50 Cr. However, a 10% lower throughput increases the need for a loan of Rs 400 Cr.

10.6.3 Varying investment levels

The results for varying investment levels are presented in the table below.

Table 10-22 Estimated cash flow for varying investment levels (in Rs. Cr.)

	Years								
	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2017/18	2025/26
Base case cash flow	78	-80	-171	-141	-17	18	257	401	147
20% higher capital cost	76	-112	-223	-189	-51	-13	248	393	59
20% lower capital cost	81	-48	-119	-92	17	50	265	408	235

Source: Consultant's calculations

A 20% variation of the capital cost on projects not already committed, applied across the board, results in comparatively similar cash flow impacts as a 10% different cargo throughput. However, no further loans are required in case the capital costs are 20% lower, while a 20% increase in the capital cost requires a loan of Rs 500 Cr early in the period.

10.6.4 Varying tariffs/royalties

The results for varying tariffs/royalties are presented in the table below.

Table 10-23 Estimated cash flow for varying tariffs/royalties (in Rs. Cr.)

	Years								
	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2017/18	2025/26
Base case cash flow	78	-80	-171	-141	-17	18	257	401	147
20% higher royalties	78	-80	-169	-136	-9	26	266	415	165
20% lower royalties	78	-80	-172	-145	-24	10	247	387	128

Source: Consultant's calculations

An overall tariff or royalty adjustment of 20% results in higher variations than the previous two adjustments. (for the period through 2007/08 no variation has been applied, as no projects will be operational by then). The impact on the financial requirements is very moderate. In case of 20% higher royalties, a loan could be reduced by Rs. 100 Cr.

10.6.5 Lower cargo throughput, lower royalties

The results for a combination of both a 10% lower throughput and 20% lower royalties is presented in the table below.

Table 10-24 Estimated cash flows in case of lower throughput and lower royalties (Rs.Cr.)

	Years								
	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2017/18	2025/26
Base case cash flow	78	-80	-171	-141	-17	18	257	401	147
Lower cargo / lower revenues	61	-99	-195	-173	-55	-22	209	369	110

Source: Consultant's calculations

The cargo throughput may be more conservative than the Base Case assumes, which may be a reflection of slower economic growth, or delays in implementation of projects in industries that are heavy users of the port, such as iron ore and agriculture. In addition, should this situation occur, then it is possible that royalty revenues will have to be adapted to fit with a slower economy, or indeed strong competition from other ports. The cash flow will be negatively impacted and with it increase the financing needs of the port to carry out all the projects envisaged. The Base Case loan of Rs. 250 Cr increases in this situation to Rs. 500 Cr.

10.7 Conclusion

Given the expected cash flow and key indicators, the port can be expected to require loans in the order of Rs. 250-400 Cr. in order to carry out all the projects that are now decided to be implemented. This financing requirement, however, will not jeopardise the port's solvency. The debt to assets ratio increases to nearly 0.3 at its peak. The financial outlook is very sound indeed and sufficient funds should be generated to sustain re-investment and expansion investment as the port and its users require so.

The outcomes appear robust for substantial variations, although the near term is susceptive to strong negative cash flow. If and when the projected substantial returns materialise over the medium to long term, the port will have to think carefully about what to do with the proceeds.

Examples are:

- Co-invest in infrastructure with private clients is a possibility, in order to obtain higher royalties, if and when the projects are viable.
- As traffic and throughput grows, the port is likely to be required to undertake substantial infrastructure investment. An example of this may be the widening of the entrance channel to accommodate two-way traffic. This would require construction of new breakwaters, which is a very capital intensive project.
- Many Major ports are now undertaking and planning capacity expansion. At the same time, private ports are increasing capacity and being constructed. As such, it is likely that at some point in the medium term, more than sufficient capacity is available, and then competition will rise and tariffs will come under pressure. A healthy reserves position is then favourable in order to be able to lower tariffs and thus retain cargo.

Introducing the budget cycle

In the proposed organisation set-up the different port groups are organised as separate business units. In the longer term, the ports might even be transformed in a separate legal entity (corporatisation). The organisation of a port into business units requires a larger budgetary autonomy for those units. It is therefore proposed to introduce a budgetary cycle, clearly linked to a strategic planning cycle. Within the budget the unit has a certain freedom to decide on expenditures. The exact degrees of freedom still have to be defined and might differ in relation to the size of the port.

Starting point of the budget cycle are the individual strategic plans per Business Unit, in combination with the overall VPT strategic master plan. Multi-annual plans will be translated in a year plan and year budget based on the expected expenditure requirements and revenue. These annual budgets should be based on internationally accepted accounting principles, taking into account all expenditure and revenue categories. Budget progress of VPT should subsequently be monitored and reviewed on a regular (quarterly) basis based on proper accounts and records.

Parallel to the budget cycle an investment programming cycle is introduced. The investments addressed in this cycle refer to major investment as minor investment will be included in the regular budget. On the basis of the overall master planning of VPT, investment needs and priorities should be identified, which should be translated in a multi-annual investment programme and an annual investment plan for the port as a whole.

11. ACTION PLAN

In general the recommendations resulting from the study on hand reflect concrete actions to meet the main objectives i.e. to transform the port of VIZAG into a port adapted to modern and competitive transport markets and to decrease the level of Government subsidies to the Port through:

a) restructuring the present port management and stevedoring organisations based on the landlord port model;
b) fostering private participation and competition in Port operations;
c) increasing operational productivity and financial performance;
d) upgrading Port facilities and linkage to inland transportation networks;
e) improving co-operation between City and Port Authorities and taking into account Urban considerations in the Port Development Plan.

An overview of the main recommendations is presented below classified by main issue or topic of attention and / or by type of activity.

The following working packages will be valid for actions to be taken by VPT.

Work Package 1 consists of the following activities (WPI)

- Initiation of project activity
- Development of DPR
    - TOR
    - Selection of Consultants
    - Final report
- Board approval to DPR and estimates
- Obtaining requisite permissions and clearances
- Approval of Government of India
- Preparation of model concession agreement
    - Tender process
- Signing of the concession agreement
- Construction/ Development phase
    - Monitoring
- Operational phase
    - Monitoring

Work Package 2 consists of the following activities (WP2)

- Initiation of project activity
- Development of DPR
    - TOR
    - Selection of Consultants
    - Final report
- Board approval to DPR and estimates
- Obtaining requisite permissions and clearances
- Approval of Government of India
- Hiring of contractor
- Construction/ Development phase
    - Monitoring

Table 11-1 Key recommendations and proposed actions

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
1	Land Use Plan	Preparation of detailed master plan for port area for 20 years perspective	• Identify existing land-use zones and future land-use zones • Implementation plan for the same • Continuous monitoring and review for the same	Feasibility Study	Consultant Contractor	5.3	Preparation of master plan = 1 crore	2007
2	Land Use Plan	Identification of suitable areas for future stacking areas and connectivity between inner harbour and outer harbour	• Identify suitable areas available for acquisition around the port area • Carry out feasibility for acquisition covering area of land to be acquired, land-holding details, cost of the land, legal requirements, etc. • Find out if these areas are populated and population density • If people reside, VPT should conduct detailed rehabilitation and relocation study for project affected persons (PAP) as per the multilateral funding agency guidelines	Feasibility Study	Consultant Contractor	5.3	For feasibility study and R & R study = 1 crore	
3	Land Use Plan	Revamping of East yard dump area – development of stack yards	• Development of additional stack areas by demolishing of the existing structures • Provision for peripheral arterial road along operational areas • Provision of service roads • Provision for transit truck terminal • Relocation of existing structures near convent Junction (area requirement = 3.5 ha built up)	WP2	Consultant Contractor	5.3	Development of stack yards = 300 crores (after demolishing, relocation and site development) Roads (about 4 km peripheral road with 3 km service roads) = 15 crores	

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
4	Land Use Plan	Truck terminal	• Proposed capacity 750 trucks per day • Provision of facilities such as parking, staying, repair, fuelling etc.	WP1	VPT GoI Consultant company Private concessionaire	5.3		
5	Land Use Plan	Development of Buffer zone	• Development of additional stack areas by demolishing of the existing structures	WP2	Contractor	5.3		
6	Port Handling Capacity	Entrance Channel and Inner Basin	• Dredging from 11m to 12.5m	WP2	VPT GoI Contractor	6.7	150 Crore Rs	By 2015/16
7	Port Handling Capacity	Strengthening of the EQ and WQ berths	• Strengthening and replacement of berths due to depth beyond the design parameters. • Suggested to involve berth 1 to 4 • Should be implemented through a concession	WP1	VPT GoI Consultant company Private concessionaire	6.8.1		
8	Port Handling Capacity	Development of WQ 6	• Development of a quay wall at berth WQ5 and WQ7 • Suggested to be handling granular products • BOT	WP1	VPT GoI Consultant company Private concessionaire	6.8.2	45 Crore Rs	2007-
9	Port Handling Capacity	Installation of mechanized facilities at WQ7 for alumina		WP1	VPT GoI	6.8.3		

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
		export			Consultant company Private concessionaire			
10	Port Handling Capacity	Fertiliser reorganisation	• Extension of fertiliser trade onto EQ6	WP1	Private concessionaire	6.3		
11	Port Handling Capacity	Construction of EQ10 and WQ8 in the inner harbour	• Development of EQ10 and WQ8 for handling caustic soda and alumina as a BOT • EQ10 to be developed as BOT • WQ8 to be developed by VPT	WP1 WP2	VPT GoI Consultant company Private concessionaire	6.8.4	35 Crore Rs 50 Crore Rs	2009 2010
12	Port Handling Capacity	Development of the east Docks	• Will be constructed with attention to receiving Panamax bulkers, but will initially be dredged to 12.5 m draft • Development of mechanized coal handling facilities	GCB		6.8.5	207 Crore Rs 60 Crore Rs	Depends on the market 2007
13	Port Handling Capacity	Development of Lova Garden Area	• Possible development to a shipyard	WP2	Consultant Contractor	6.8.6		
14	Port Handling Capacity	Upgrading and Replacement of equipment Ore Handling Complex		WP2	VPT Consultant Contractor	6.8.7	150 Crore Rs	
15	Port Handling	Upgrading OR-1 and	• Reconstruction of jetties for increased	WP2	VPT after	6.?.?	60 Crore Rs.	2008

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
	Capacity	OR-2	vessel sizes and handling capacity		consultation with operator Consultant			
16	Port Handling Capacity	LPG Berth enhancement	• Additional lines for handling petroleum products	WP2	VPT after consultation with operator Consultant	6.?.?	23 Crore Rs	2008-2009
17	Port Handling Capacity	Relocation of the NOM (New Oil Mooring)	• Relocation of the current NOM	WP2	VPT Consultant Contractor	6.8.8	30 Crore Rs	
18	Port Handling Capacity	Extension of the container terminal	• Additional equipment is needed • Extension possible with adjacent land	WP1	VPT GI Consultant company Private concessionaire	6.8.9	120 Crore Rs	
19	Port Handling Capacity	Development of the fishing harbour	• Possible development into a stacking area and small feeder terminal	Feasibility Study	Consultant Contractor			
20	Infrastructure	Port connectivity with national highway and associated projects	• Widening of the approach road from Industrial By-pass road to RCL Junction to four lanes to meet traffic requirements. • Construction of service roads	WP2	VPT Consultant Contractor	6.3.1		
21	Infrastructure	Outer Harbour Connectivity	• Improvement of road from Khobbari Thota Junction to the fishing harbour junction (widening from 2 lanes to 4 lanes, 5000 km)	WP2	VPT Consultant Contractor	7.3.1	15 Crore Rs	2007-2009

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
22	Infrastructure	Outer Harbour Connectivity	• Flyover roads on OH connectivity road (600 m, 4 lane 2 way + 2 ramps 300m 2 lane 1 way)	WP2	VPT Consultant Contractor	7.3.1	3 Crore Rs	2007-2009
23	Infrastructure	Outer Harbour Connectivity	• Flyover road from outer harbour to inner harbour over (600m, 4 lane 2 way)	Feasibility study	Consultant Contractor	7.3.1	9 Crore Rs	2007-2009
24	Infrastructure	Inner Harbour Connectivity	• In/Out movement to EQ to/from outside the port • Ramp near Ambedkar Junction level crossing for facilitating traffic movement towards EQ north gate and GFCL gate • 4 lane 2 way Total length approx. 600 m	WP2	VPT Consultant Contractor	7.3.2	16 Crore Rs	
25	Infrastructure	Inner Harbour Connectivity	• In/out movement to WQ from outside the port • Flyover road for following movements: • WQ In – 2 lane, 1 way 500m • WQ Out – 2 lane, 1 way 700 m • Towards WQ – 2 lane, 1 way 600 m • Towards EQ – 2 lane, 1 way 500 m	WP2	VPT Consultant Contractor	7.3.2	34.5 Crore Rs	2007-2009
26	Infrastructure	Inner Harbour Connectivity	• Movement between EQ to WQ area • Flyover roads on either side of the conveyor belt • From WQ to EQ – 2 lane 1 way, 1000 m • From EQ to WQ with ramps towards – 2 lane, 1 way 1200 m	WP2	VPT Consultant Contractor	7.3.2	33 Crore Rs	2007-2009
27	Infrastructure	Western Sector connectivity	Option 2 • Strengthening of existing road along M/s	WP2	VPT Consultant	7.3.3	52 Crore Rs	2012-2013

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
			Sarat Chatterjee & Co. (at grade, 2 lane 1 way, 800m) + • New road along CFL affluent channel (at grade, 2 lane 1 way, 500m) + • Flyover (4 lane 2 way, 1200 m) with 1 ramp (2 lane 1 way, 500m) + • Bridge across Meghadrighedda (@ 300 m span) Option 3 • Construction of a new road (at grade, 2 lane 500m length) + • Flyover 4 lane, 2 way 1200 m with 2 ramps 2 lane 1 way each of 250m + • Bridge across Meghadrighedda (@ 300 m span)		Contractor			
28	Infrastructure	Other road projects	• Providing new roads outer peripheral road and inner service roads along the new railway layout at east yard Strengthening the existing stretches + laying new roads (about 4 km 2 lane roads)	WP2	VPT Consultant Contractor	7.3.4	15 Crore Rs	2007-2008
29	Infrastructure	Development of R & D yard at Mindi and associated facilities	• Strengthening of existing connection between Mindi and Vadlapudi • Construction of fly over bridge (4-lane) on NH-5 at BHPV for about 750 m where the existing railway line connecting Mindi and Vadlapudi crosses NH-5 • Direct connection from Duvvada and Simhachalam is also under consideration	WP2	VPT Consultant Contractor	7.5.1	100 Crore Rs	2007-2010

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
			• Mindi yard with facilities such as rail lines, cabins, railway electrification etc.					
30	Infrastructure	Providing additional connectivity to Mindi yard from RCL	• laying of 5.9 km of broad gauge track starting from RCL to the proposed Mindi Yard • It will have 13 numbers of culverts • One major bridge across Meghadrighedda	WP2	VPT Consultant Contractor	7.6.2	30 Crore Rs	2007-2010
31	Infrastructure	Revamping east yard	• Laying of 6 full rake capacity railway lines for manual loading • Laying of 2 full rake capacity railway lines for mechanized loading with wagon loader • Laying of Conveyor tracks for mechanized Coal handling	WP2	VPT Consultant Contractor	7.6.3	7.5 Crore Rs	2007-2009
32	Infrastructure	Other infrastructure Projects	• One siding (track length of 680 m) between H-7 shed and Sea Horse Junction for container traffic	WP2	VPT Consultant Contractor	7.6.4	1.0 Crore Rs	Sept 06 – Aug 07
33	Infrastructure	Other infrastructure Projects	• One siding (track length 1100 m) at West of R & D Yard for facilitating rail bound cargo handling for existing sheds of lessees	WP2	VPT Consultant Contractor	7.6.4	2.5 Crore Rs	Aug 06 – Sept 07
34	Infrastructure	Other infrastructure Projects	• Extension of existing railway line (by about 2 km) in outer harbour catering to container terminal upto fishing harbour. • There is a proposal of relocating the existing fishing harbour to another place and reclaiming the available area for development in future. Keeping this	WP2	VPT Consultant Contractor	7.6.4	5.0 Crore Rs	2010-11

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
			development in mind, the existing rail line can be extended to serve the fishing harbour area.					
35	Infrastructure	Other infrastructure Projects	• Laying of new railway line 1E in R & D Yard to increase the holding capacity	WP2	VPT Consultant Contractor	7.6.4	2.5 Crore Rs	Jan 07 – Sept 07
36	Infrastructure	Other infrastructure Projects	• One siding (Track length 1100) east of OHC along M/s ONGC for facilitating rail borne cargo handling	WP2	VPT Consultant Contractor	7.6.4	2.5 Crore Rs	Aug 06 – Sept 07
37	Infrastructure	Other infrastructure Projects	• One siding at EIPL area along industrial bye-pass road	WP2	VPT Consultant Contractor	7.6.4	2 Crore Rs	Jan 07 – Sept 09
38	Infrastructure	Other infrastructure Projects	• Five additional sidings (5 tracks each 685 m) along North & South sides of JP Line. Out of these 5 one will be laid now (i.e. JP2)	WP2	VPT Consultant Contractor	7.6.4	12.5 Crore Rs	Aug 06 – Mar 08
39	Infrastructure	Other infrastructure Projects	• Five additional sidings (5 rail lines each 700 m long) in Karasa area taking off from internal rail connectivity	WP2	VPT Consultant Contractor	7.6.4	15 Crore Rs	Aug 06 – Mar 08
40	Infrastructure	Other infrastructure Projects	• Laying of an additional line between RCL level crossing and NAD level crossing towards north of existing Railway lines	WP2	VPT Consultant Contractor	7.6.4	2.5 Crore Rs	Aug 06 – Mar 08
41	Environment	Air pollution control	• Coal handling at GCB should be fully mechanised so that coal dust problems are avoided.	WP2	VPT Consultant Contractor	8.2.1		

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
42	Environment	Vehicular emissions	• All the port vehicles should be converted into either CNG or LPG driven.	WP2	VPT Consultant Contractor	8.2.2		
43	Environment	Noise Pollution Control	• Installation of electrical systems • Rubber padding for noise generating equipment • a physical barrier should be provided between the harbour area and the nearby residential houses	WP2	VPT Consultant Contractor	8.3		
44	Environment	Noise Pollution Control	• Provision of earmuffs and other equipment to workers and at noisy environments	WP2	VPT Consultant Contractor	8.3	5 Lakhs Rs	
45	Environment	Water Pollution control	• slurry holding tank is proposed on the iron ore berth	WP2	VPT Consultant Contractor	8.4.1	25 Lakhs Rs	
46	Environment	Water Pollution control	• Detailed quantitative and qualitative Investigation of City wastewater meeting Harbour area and install a Sewage Treatment Plant to treat city sewage	WP2	VPT Consultant Contractor	8.4.2	25 Crore Rs	Depending on decisions from VMC
47	Environment	Industrial Waste Water	• form a committee to investigate the industrial pollution problem and undertake mitigative measures under its guidance • Undertake a thorough study on the investigation of quantities of effluents discharged by each industry in the port area and assess the quality of effluent of	WP2	VPT Consultant Contractor	8.4.3	50 for study (tentative Cost of ETP would be 40 lacks per mld)	Depending on quantity available

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
			each industry. While assessing the quality, samples should be taken after the effluent leaves industry premise. • Construct a CETP by taking contributions from the industries. The CETP may contain a flocculater, aeration tanks, aerobic/anaerobic treatment, chemical treatment if required, oil skimmers, sludge separator, etc.					
48	Environment	Garland drains around storage yard	• Provide a proper lining/flooring in the storage yards • Provide garland drains and collect the contaminated water in collection pits adjacent to the storage area. The cargo can be recovered from this slurry. • A multilayer greenbelt around the storage areas. This greenbelt should cover trees of various heights, and bushes in between trees. This greenbelt would prevent transportation of dusty cargo to far off places.	WP2	VPT Consultant Contractor	8.4.4	14 Crore Rs	
49	Environment	Contaminated Sediments Disposal	• The sediments should be monitored once in every season, for different chemical and biological parameters to assess the extent of contamination	WP2	VPT Consultant Contractor	8.4.5		
50	Environment	Dredging	• Vacuum dredging (cutting and sucking) should be used instead of mechanical dredging as far as possible, since mechanical dredging creates turbidity in water. • When mechanised dredges are used, it is	WP2	VPT Consultant Contractor	8.4.6		

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
			suggested that the dredging should be started from the upstream end to the water current and continued in the downstream direction, to minimise the deposition of resuspended sediments in the downstream area. • The development of environmentally sound spoil disposal practices requires an intimate knowledge of die biological communities associated with a specific disposal site.					
51	Environment	Wastes from ships and oil spill	• A system to treat sewage and bilge water received from the ships/tankers must be in place. • Records of treatment details, quantities of treated sewage, discharge location, etc should be kept	WP2	VPT Consultant Contractor	8.5	1 Crore Rs	
52	Environment	Environmental Management Cell	• to ensure that STP function properly and meet effluent discharge standards • to ensure systematic and routine housekeeping, especially at the terminals • to maintain the greenbelt • to remove oil slicks from the water • to create awareness of pollution hazards among all VPT personnel related to the harbour area , especially those involved in cargo handling • to maintain environmental quality' analysis laboratory and analyse air, water, sediment, and soil samples on a regular basis	WP2	VPT Consultant Contractor	8.6	2 Crore Rs	

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
53	Environment	Other projects	• EIA for all Construction Components	WP2	VPT Consultant Contractor		Crore Rs	
54	Environment	Other Projects	• Slope protection in inner harbour	WP2	VPT Consultant Contractor		5 Crore Rs	
55	Organisational Policies		• Modernisation of the port administration aiming at improvement of the management of Visakhapatnam Port as well as port operations and services; • Commercialisation of port activities and/or port services. This implies a change in the behaviour of the port services in such way that the activities will be carried out based on market principles; and • Corporatisation of selected port activities and/or services.	WP2	VPT Consultant Contractor	9.2.1		
56	Organisational Policies	Business Development & Marketing Department	• the set up of a commercial information system based on separate accounts; • the preparation of an active promotion policy (advertisements, participation in commercial fairs, etc); • the preparation and erection of a port promotion council together with existing port users; • the formulation of an acquisition policy focusing on industry, logistic companies and free zone interests; and	Feasibility study	Consultant Contractor	9.3		

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
			• the formulation of a tariff and discount policy fitting the strategic aims of NMPT and the national policy rules for major ports.					
57	Organizational Policies	Marine Services	• To enable night berthing it is recommended to purchase a tug boat of 75 tons bollard pull and to widen the entrances channel neat the harbour mouth • In case VLCC will be handled at the SBM, NOM facility and probably also for the OSTT at least two tugboats of 70 tons bollard pull will be required.	WP1	VPT GoI Consultant company Private concessionaire	9.3.1		Depending on demand for Cape Size vessels
58	Organizational Policies	Business and Marketing department	• Business plan update frequently • Rolling plan for the long term including a programme for the medium and short term.			9.3.2		
59	Organizational Policies	Human Resources	• Reduce the class III and the class IV strength by offering SVRS, the scheme shall be attractive and beneficial to the employee, the normal eligibility, compensation and benefits are discussed above. • There shall be no further recruitment in class III as well as class IV. • Interested class III, II and I employees shall be trained to take higher positions and responsibilities. They shall be trained to work with systems and procedures according to international standards. • The change management and	Feasibility study	Consultant Contractor	9.5.4		

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
			particularly the transition phase will be very critical and thus it is recommended to have on board experienced advisors in a temporary position to shape the new organization structure.					
60	Information technology	Port Community System (PCS)	• An evaluation of the ports' readiness to integrate with the PCS must be undertaken in order to avoid the delay in implementation	Feasibility study	Consultant Contractor	9.6.2		
61	Information technology	Management Information System	• The proposed MIS can help the managers right from the performance measurement, alert management (using dashboard) to trend analysis and forecasting (regular or query based reports).	WP2	VPT Consultant Contractor	9.6.3		
62	Information technology	Other Projects	• Control room for monitoring vessel operations, rail and storage/stack yard operations. Tracking of wagons/rakes using RFID technology can be explored • Traffic department to share the functionality of control room related to berth allocation • Marine scheduling - pilots, tugs, mooring gangs, vessel movements in conjunction with berth allocation • Activity based costing in order to have substantiated in puts for revising the tariff as well monitor the cost activity wise • E-tendering / procurement for materials management • Work flow management – this will help	WP2	VPT Consultant Contractor			

	Issue	Item / topic	Recommendation / action	Action by VPT	Organisations involved	Paragraph	Budget	Timing
			reducing the paperwork and also reduce man efforts • Document Management System making available all important document online • Project planning and management – to plan various projects and monitor against planned vs. actual efforts in terms of manpower, material and timelines • A powerful Management Information System drawing inputs all IT systems and providing information necessary for decision making for the management					

Annexes

ANNEX TO CHAPTER 2

ANNEX 2.1 Port Internal Road Network Details

Sr. No.	Name of the road	Approx. Length (m)	Approx. width	Type of road	Year of resurfacing	Present status	Year of strengthening
1	Road from old customs office to H-8 junction via GCB gate and MW Office a) Old customs office to GCB west gate and west gate of GCB to S L canal culvert b) S L canal culvert to H-8 junction	 656 250	7.0 7.5 7.5	BT surface	1995 1999 1995	Good condition	Completed on November 2004. Tender under finalisation for road no 1(a)
2	Road along S-6 conveyor from H-8 junction to mini super bazaar junction	750	7.5	BT surface	1999/2004	Good condition	Completed on November 2004.
3	Road from harbour police station to dock area main gate (diagonal road)	450	9.0	BT surface	1992	Good condition	Non operational and presently not necessary to regrade
4	Road from harbour police station to old AE (Rly.) office (Reid road)	420	5.6	BT surface	1998	-	Estimation under preparation. Pending in view of development of berths
5	Road from mini super bazaar junction to dock area main gate via old AE (Rly.) office (Fringe road)	995	5.5	BT surface	1992	-	Estimation under preparation. Pending in view of development of berths
6	Road from marine complex to pool khalasi junction	500	7.0	BT surface	1998	Good condition	Estimate to be prepared
7	Road around S-2 and S-3 shed a) North side b) South side	 450 350	 11.0 4.0	BT surface	1995	Good condition	Estimation under preparation. Pending in view of development of berths
8	Road from EQ-1 east gate to AP fisheries freezing plant junction via S-4 shed	800	7.5	BT surface	1995/2004	Good condition	Regrading and strengthening were completed in October 2004
9	Road from poet office to port laboratory	400	9.0	BT surface	1998	Good condition	Regrading and strengthening were completed in October 2004
10	Road from mini super bazaar junction to harbour police station junction	455	9.2	BT surface	1992/2004	Good condition	Regrading and strengthening were completed in October 2004

Sr. No.	Name of the road	Approx. Length (m)	Approx. width	Type of road	Year of resurfacing	Present status	Year of strengthening
11	Road at north and west side of AOB	320	6.5	BT surface	1998	Good condition	Non operational and presently not necessary to regrade
12	Road from harbour police station junction to HSL yard (Ambedkar front side road)	445	11.0	BT surface	1995/2004	Good condition	Regrading and strengthening were completed in September 2004
13	Road from CPCR junction to mini super bazaar junction (AOB east side road)	450	9.0	BT surface	1991	Good condition	Estimate to be prepared
14	Road along S-6 conveyor (rear side of FCI shell type godown)	500	7.0	BT surface	1991/2006	Good condition	Work completed in May 2006
15	Road from dock area north gate to Rly. Level crossing at seahorse junction	600	11.0	BT surface	1997/2004	Good condition	Work completed in November 2004
16	Road along S-6 conveyor along H-7 to north east of shell type godown	854	6.0	BT surface	1992/2006	Good condition	Work completed in May 2006
17	Road from CPCR junction to bend at north end of R-2 area	600	9.0	BT surface	1995	Normal	Estimate prepared and sent to divisional office for scrutiny
18	Road from north of new general stores to the junction at north end of R-2 area (road in front of cement shed)	710	6.5	BT surface	1995	Normal	Estimate to be prepared for regrading
19	Road from dock area north gate to Ambedkar statue junction (6 lane)						
	a) East side road	1000	11.0	BT surface	1997/2003	Good condition	Work completed in May 2003
	b) West side road	1000	11.0	BT surface	1997/2006	Good condition	Work completed in March 2006
20	Road from Ambedkar statue junction to H-7 approach road	280	3.75	BT surface	1999	Good condition	-
21	Road from ornamental gate way to the junction at Kobbari Thota via nursery	800	22.0	BT surface	1999/2006	Good condition	Work completed in March 2006
22	Road from west of H-7 to NALCO level crossing						
	a) H-7 to S-4 conveyor junction at 6-lane road	200	5.5	BT surface	1999	Ruts formed	Estimates prepared and sent for sanction

Sr. No.	Name of the road	Approx. Length (m)	Approx. width	Type of road	Year of resurfacing	Present status	Year of strengthening
	b) South S-4 conveyor junction to newly constructed WQ-7 gate	900	7.5	CC blocks	1999/2004	Good condition	Regrading and strengthening were completed in October 2004 (with cc blocks)
	c) Road on S-4 conveyor from south east of IMC limited to NALCO level crossing via TOCL	400		BT surface	1999/2004	Good condition	Regrading and strengthening were completed in October 2004 (with cc blocks)
23	Road east of GFCL from EQ-7 to S-4 conveyor b) CC blocks pavement	600 600	7.5 7.5	BT surface CC blocks	2005 2004	Good condition Good condition	Completed on October 2005 Completed on October 2004
24	Road from WQ junction to NALCO level crossing (OHC road) a) STP junction to north gate b) Along OHC	860 840	7.5	BT surface	2000	Normal	360 m was regarded on 30.05.2005. Estimate under preparation for regrading of road from OHP main gate to west quay level crossing
25	Road from WQ junction to junction at ESSAR south west gate (link road) a) WQ junction to SBC compound wall	760	-	CC blocks	2003	Good condition	-
	b) SBC compound wall to ESSAR junction	1540	7.5	BT surface	1998/2004	Normal	Regrading completed in October 2004
26	Road from Nehru FOB east to NALCO level crossing via STP	700	7.5	BT surface	1999	Disintegration observed	Estimate to be prepared for regarding
27	Road from Nehru centenary flyover bridge to the turning to SS Nagar junction (KR and Sons Road)	1500	7.5	BT surface	1999	-	Work order issued (work in progress)
28	Road from SS Nagar junction to CWC godown	1000	7.5	BT surface	1999	Good condition	Estimate to be prepared for regarding
29	Road from west of Ambedkar FOB to parallel bridge via ESSAR						

Sr. No.	Name of the road	Approx. Length (m)	Approx. width	Type of road	Year of resurfacing	Present status	Year of strengthening
	a) West end of Ambedkar FOB to ESSAR junction	450	7.5	BT surface	2002/2005	Good condition	Road repair done by NHAI
	b) ESSAR junction to parallel bridge	1050	7.5	BT surface	2002/2005	Good condition	Road repair done by NHAI
30	Road from CWC junction to Y junction	1300	7.5	BT surface	1999	Good condition	Estimate under scrutiny
31	a) Nehru centenary flyover bridge across R& D railway line	1300	7.5	BT surface	2001	Normal	Proposed laying of BC through NHAI
	b) Ambedkar flyover bridge across OHC dumper lines			CC	2004	Good condition	-
32	Sardar Patel bridge across Meghadrighedda joining at north west area	325	7.3	BT surface	2004/2005	Normal	Proposed laying of BC through GR Constructions

ANNEX 2.2 Port Internal Rail Network Details

Sr. No.	Description of yard /siding	No of railway lines	Track length (KM)	No of points and crossings	Equated track length (KM)
	VPT Rail System				
1	G.C.B. I Outer Harbour; New shed line, old shed line & Channel line Old Channel line	4	4.430	11	5.530
2	GCB West of Warehouse shed lines 1&2.	2	1.120	3	1.420
3	East Yard: RLl, RL2, RL3, RU, Dump No; 1,2,3,4,5,6,7,8&9, GCB New line & Old line, SI.S2 & S3 Shed lines Old G/Stores Line	26	10.007	24	12.407
4	Gymkhana line	1	0.500	1	0.600
5	East Yard Holding Line	1	0.660	2	0.860
6	Dock area; F site line, NSD line 1&2, Dock area main line & loop line, T2 service line,T2 holding line,T3 service line & Holding line,T4 shed line T3 platform line,T5 Shed line,T6 shed line & T6 Channel line,T2,T3,T4& T5 Channel lines. Wharf line 1&2 at EQ-7 on lines T2 & T3	15	6.094	17	7.794
7	North Holding Yard: 6,7,8,9,10,11,12, 13, 14,15,16&17; Cement godown shed Line	13	8.790	30	11.790
8	Route 'Y' Connecting to East Yard. Route X Line	2	2.500	7	3.200
9	Additional Rly line Route 'Z' by the side of Route 'X' at N.H. Yard	1	0.710	2	0.910
10	R- I, 2, 6, 7, 8, 9 & R-I1 area and 100 TWB & G/Stores	8	8.180	14	9.580
11	Convent Junction Line to R-I1 area loop line & main line.	2	1.100	4	1.500
12	Holding line by the side of R11.	1	0.485	2	0.685
13	Additional Railway Line R12. R13. R14 R15 at N.H. Yard	4	2.450	7	3.150
14	N.R Yard: RL6, BG Loco shed lines 1,2&3&Gatherine: line	5	1.618	8	2.418
15	R&D Yard:1, 2, 3, 4, 5, 6, 7, 8, 9, 10	10	12.320	23	14.620
16	R&D yard 1-A Line	1	0.773	2	0.973
17	R&D yard 1-B & I-C Line	2	1.469	4	1.869

BUSINESS PLAN VPT

Sr. No.	Description of yard /siding	No of railway lines	Track length (KM)	No of points and crossings	Equated track length (KM)
18	Additional Railway line I-D, OEC Curve & Link Line at R&D Yard	3	1.632	11	2.732
19	Additional Railway Spur 1	1	0.350	2	0.550
20	Additional Railway Spur 2	I	0.435	1	0.535
21	Additional Slacking area at East of NALCO at dead end.	1	0.200	1	0.300
22	R&D Yard: 11, 12, 13, 14 &15	5	3.265	10	4.265
23	Coal Berth area A VR1, 2,3 & BOC main & loop& Channel line un to WO-4.	6	4.735	8	5.535
24	New A VR Extension for special C/Coal	1	0.790	1	0.890
25	Direct Entry Lines (DEL) 1, 2, 3, 4	4	3.180	10	4.180
26	1.P Main line loop line, Mindi yard main line & loop line, North of parallel bridge main line & loop line, South of parallel bridge main line & loop line, Link line	15	12.290	13	13.590
27	CWC VPT extension line	1	0.610	1	0.710
28	Additional holding line at Western ~1or by the side of Sarat-chalter & co.	1	0.864	2	1.064
29	Holding line no: 1 trY the side of bulb line.	1	0.487	1	0.587
30	Holding lineno:2 by the side of bulb line.	1	0.404	0	OA04
31	Western Sector: IOC holding line 1,2&3,HPCL holding lines 1,2&3, Right off way bridge line, CISF Quarters Line, ESSO Line, Swimming Pool Line	12	6.013	13	7.313
32	Twin Tippler: A,B,Bl,C,D,Dl, Third Tippler E.FGG	10	11.150	45	15.650
33	Ertmtv Grid lines:1A&1B 1 2,34,56789.10	11	7.000	25	9.500
34	Loop Line around O.H.C:Main line	1	3.640	5	4.140
35	ESSR Manual Unloading Line NO.I&2	2	1.750	2	1.950
	A. Total (VPT Rail System)	**175**	**122.001**	**312**	**153.20 I**

Sr. No.	Description of yard /siding	No of railway lines	Track length (KM)	No of points and crossings	Equated track length (KM)
	Private Sidings				
36	M/s H.P.C (Old)	2	0.30	3	0.600
37	M/s H.P.C.L (Caltex)	4	1.95	10	2.950
38	M/s H.P.C.L (POL New)	2	0.83	3	1.130
39	New LPG Gantry	4	1.68	12	2.880
40	M/s H.P.C.L (POL Old)	5	1.56	5	2.060
41	Coromandal Fertilisers	8	4.50	13	5.800
42	Food Corporation of India 'F'siding and 'G' siding	4	2.08	12	3.280
43	Food Corporation of India Gananapuram	3	1.48	6	2.0&0
44.	a) Steel Authority of India (SAIL)	4	1.43	4	1.830
	b) SAIL Shed Line (New)	1	0.90	11	1.000
45.	Zinc Siding (M/s. HZL)	3	2.70	11	3.800
46.	M/s NALCO	7	5.01	15	6.51
47.	Central Warehouse Corporation (CWC)	3	1.50	6	*2.W*
48.	Sarat Chatteriee	I	1.4	2	1.600
49.	M/s G.F.C.L	6,	2.94	13	4.240
50	VCI'PL Lines at MPB	2	1.50	2	1.700
51	Visakhapatnam Sea Port Lid	5	2.50	8	3.300
	B. Total (Private Sidings)	**64**	**34.26**	**126**	**46.860**
	Grand Total (A + B)	**239**	**156.261**	**438**	**200.061**

ANNEX 2.3 Lease contracts in the port of Visakhapatnam

S .. NO.	NAME OF THE LESSEE	ACS. CTS	Period	Purpose
1	A.K.Corporation	5.00	50 Years	Re-Rolling Mill
2	C.W.H.C.	10.1577	30 Years	Warehouses
3	C.W.H.C.	23.20	30Years	Warehouses
4	D.L.B	17.25	30Years	Kailspuram Res.Qtrs.
5	DOLPHIN CONSTRUCTION	15.00	30Years	Construction of Warehouses
6	E.S.I. Corporation.	10.123	50Years	110 Bedded Hospital
7	Hy-Grade Pellets	110.00	30Years	Pelletisation Plant
8	HY-GRADE PELLETS	24.64	29Years	Stockpile Area
9	F.C.I	7.05	99Years	Godowns
10	H.P.C.L.	511.03	99 Years	Oil Refinery
11	H.P.C.L.	15.00	50Years	Wharf Terminal
12	H.P.C.L.	8.00	30Years	CISF Barracks & quarters
13	H.P.C.L.	17.56	20Years	LPG Filling plant & storage tanks
14	H.P.C.L.	13.45	50Years	Cavern Projects
15	I.O.C.	45.00	38Years	Terminal
16	K.R.Sons Pvt.Ltd.	10.00	30Years	Ware House
17	N.M.D.C.	6.11	20Years	Screening Plant
18	O.N.G.C.	10.00	30 Years	Stock Yard
19	R.C.L.	42.50	30Years	Plant
20	S.A.I.L.	10.0075	25Years	Stack yard
21	Hy-Grade pellets	11.50	29Years	Fine Ore Stock Pile
22	E.I.P.L	50.00	30Years	For setting up LPG Transit storage facility
23	G.A.I.L.	41.90	30Years	LPG Dispatch station
24	S.A.I.L	17.31515	20 + 25Years	Modernising Stock Yard
25	HyGrade Pellets	6.678 +0.14	25years	Water pipe line
26	B A R C	5.00	30years	Const. Of Staff Qrtrs & Liaison Office
27	GAIL	7.50	30years	Pipeline

S .. NO.	NAME OF THE LESSEE	ACS. CTS	Period	Purpose
28	Hindustan Shipyard Ltd	55.13	99years	Ship Building Yard
29	Hindustan Shipyard Ltd	145.12	99 Years	Staff Colony
30	Hindustan Shipyard Ltd	16.00	99 Years	Extension of Yard
31	Hindustan Shipyard Ltd	27.113	99 Years	Dry Dock
32	Hindustan Shipyard Ltd	7.083	99 Years	Extension of Staff Colony
33	Hindustan Shipyard Ltd	12.60	30 Years	Extn. of Ship Yard
34	Hindustan Shipyard Ltd	15.00	30Years	Of Shore Plat Form
35	Hindustan Shipyard Ltd	11.00	30Years	Eastern Off shore Project
36	NSDRC	5.00	30Years	Office Building
37	Coast Guard organization	21.04	20 Years	Office Cum Residential complex
38	Ship Building Centre	24.86	30 Years	Ship Building Centre
39	Defence Estate Officer	5.77	Temporary	Pipeline
40	Defence Estate Officer	152.14	Temporary	Transit Area
41	Navy	5.10	30years	Approach road
42	Navy	6.00	30Years	Approach Road
43	APCL	75.00	30 yrs	Petrochemical Plant
44	M/s. BPCL	40.00	30 yrs	Tankages
45	M/s.C.F.L.	483.52	50 yrs	Fertilizer plant
46	M/s. V.D.R.	8.75	20 + 10yrs	Godown
47	Ripley &Co.	11.97		
	20 + 10yrs	Godown		
48	HPCL	5.6089	30 yrs	Constructing of Railway Gantry lines
49	NALCO	22.48		
	30 yrs	Handling storage of Alumina & Caustic soda		
50	GFCL	9.81578	30 yrs	Handling storage of Liquid Ammonia, Edible Oils & Molasses
51	Sarat Chatterjee & Co Vsp Pvt Ltd.,	6.00	30 yrs	Construction of Godowns
52	M/s. HPCL	212.31	30 yrs	Construction of additional storage

S .. NO.	NAME OF THE LESSEE	ACS. CTS	Period	Purpose
				tank
53	Alufloride	7.00	20Years	Fluoride Plant
54	M/s.Duraflex Services & Const.,Technologies Ltd.,	5.83	30 years	Godown
55	Prathyusha Stevecon (p) Ltd.	6.06	30 yrs	Construction of warehouses
56	Vizag Sea Port Ltd.,	24.16	30 yrs	Backup Space
57	Gateway East India Pvt.Ltd.,	20.00	30 yrs	CFS/ Warehouses Truck Parking
58	VCTPL	12.31	30 yrs	Backup space
59	VCTPL	28.34	30 yrs	Addl. Backup area
60	LMJ Internationals	5.00	30years	Development of Agro processing plants and Storage sheds
61	LMJ Internationals	6.00	30years	Development of Agro processing plants and Storage sheds
62	KRIBHCO	6.00	30years	Construction of godowns
63	ISPRL	38.00	(Approx)30years	Crude oil storage
64	Rain Calcining Ltd.	5.00	30years	Development of warehousing
65	Prathyusha Associates	5.00	30years	Development of warehousing
66	Rain Calcining Ltd.	5.00	30years	Development of warehousing
67	Continental Warehousing Corp.	6.00	30years	Development of warehousing
68	A.P.S.W.C.	12.00	30years	Development of warehousing

Source: Visakhapatnam Port Trust Estate Division

ANNEX 2.4 Options for financing the proposed investments in Visakhapatnam

There are several options for financing the proposed investments in Visakhapatnam. Potential sources of financing to recover the investment costs include:

- self-financing from reserves;
- debt (borrowing, bond issues) and equity (raising of new capital) financing;
- user financing: for example, the user of a terminal finances its development; and
- joint-venture financing: the costs are borne both by the port authority and the user (e.g. a ship-owner, a shipper or end-user, or a terminal operating company) and established in a concession or lease.

Self-financing from reserves

Self-financing from reserves is a major option for financing port investment. However, it may be only sufficient for investments of relatively modest size. Whenever a more substantial investment is required, additional funds need to be used. For instance, unused physical assets without potential port use can be sold or revenues from the sale of port land could be made available to the port authority. Institutional changes in the latter can help too. For instance, a port authority could decide that terminal operating companies will provide the quay pavement and cranes.

The current situation in VPT will allow only a relatively modest part of new investments to be financed from reserves. This possibility is particularly constrained due to the requirements with respect to the Pension Fund liabilities. Part of the future investments may be financed from additional resources generated during the business plan if and when profits are realized.

Debt and equity financing

Debt financing, notably from multilateral development agencies and backed by the government has been a popular way to undertake port development in developing countries. Major lenders are, for instance, the World Bank and the Asian Development Bank. There may also be opportunities for local commercial banks, equity and bond markets, and institutional investors such as insurance companies and pension funds to finance port development. This requires however sufficient return on the proposed investments.

Commercial debt financing typically involves a syndication of lenders, which can be time consuming and complex. Also commercial banks are constrained by the time profile of their deposits as they cannot prudently lend large volumes of long-term debt. The longest international commercial bank loans are typically 7-12 years. In contrast, many infrastructure projects require financing of over 10 years maturity if the tariffs to service the debt are not to be prohibitive.

User financing

User financing may apply to the development of a port, or port-related facilities as dedicated facilities owned by the user. It generally relates to bulk terminals and, under certain circumstances. It can be carried out by national organizations, either from the public or private sector or by trans-national corporations. Normally, the port facilities are part of a substantially wider investment, for example, centered on an inland mining development, which also includes a connecting railway.

User financing is very evident at both ends of the bulk oil trades. Oil company-owned facilities are very much in evidence in oil importing locations along with some port authority owned oil jetties. Terminals loading iron ore are often financed by trans-national bodies, with the same organizations owning or substantially owning iron mines and connecting railways. The situation in discharging ports is more varied. An iron ore-importing terminal may be owned by a steelworks or by a port authority. Aluminium is another industry where there is a substantial trans-national presence, in relation to the financing and operation of terminals: in this particular context, both at exporting and at importing ports.

User financing of port investment may also take more indirect forms. For instance, in the grain trade, a majority of the grain loading ports used by large bulk carriers are operated by international grain trading houses and agricultural co-operatives. This is also indicative of the ownership and source of finance for grain terminal development. Most of the terminals receiving grain imports in large bulk carriers are privately owned or leased, and operated by international grain houses or stevedoring companies.

Joint ventures

A joint venture may be set up, for example, between a port authority and another party with financial resources and management skills relevant to a particular traffic. Its relevance may relate not only to being a potential source of capital for investment, but more importantly to possibly providing a way of increasing port competitiveness.

In the Land Lord Model the usual type is the granting of a lease or concession to a terminal operator. This is the case for landlord port authorities selecting, often through competitive bidding, companies to lease land and/or facilities to develop and operate terminals. Normally, in this case, the port authority's only say in the management of the facility is specified in the terms of the lease. Whole port areas may be leased to these operating companies where quays and backing areas, transit sheds and cranes already exist. The extent, adequacy and quality of port facilities leased make a substantial difference to the investment requirements for any company taking up a lease in a port.

The lengths of leases, or concessions, depend on what is being leased; equipment leases are liable to be relatively short, leases of land and terminals longer. Commonly, leases of terminals and land run over periods of 15-30 years. The valuation of the assets is a very important item when concluding a lease.

An important point to be considered by the port authority in leasing out terminals is the treatment to be given to users by the lessee. This together with other factors such as performance benchmarks and the risk of not materialized traffic expectations need to be incorporated in the clauses of the contract. In general, the overall framework is that of a close collaboration of the port authority with the operators for the benefit of the port as a whole.

A common arrangement of joint venture is the Build-Operate-Transfer or BOT-arrangement, of which many different forms exist. Typically, a private party (or consortium) agrees to finance, construct, operate and maintain a facility for a specific period and then transfer the facility again to the port authority. The port authority will provide the land while the consortium would be responsible for construction, which could involve the construction of infrastructure, for instance, quay walls as well as superstructure. The port authority keeps then control over the land while the developer's equity stake is a guarantee to the port authority that the facility will be well managed.

ANNEX 2.5 Vessel Navigation

The time taken for berthing at the inner as well as the outer harbour is approximately 2 hrs and 15 minutes excluding the OSTT and the New Oil Mooring (NOM) where the time taken is almost 3 hrs and 15 minutes. Primarily the time difference is due to passing of extra mooring lines at OSTT and NOM compared to other berths.

The time taken for sailing at inner as well as the outer harbour is approximately 1 hr. this time decreases to as much as 35 minutes for sailing vessels close to the channel like OR1, OR2, WQ3 etc. The sailing pilotage for vessels at NOM and OSTT is approximately 1 hr 20 minutes and 1hr 30 minutes respectively.

The pilotage for vessels berthing and sailing consequently is normally done by separate pilots, however there are occasions when the pilot sails the vessel and directly board other vessel for berthing. It was understood that there is such possibility of almost 25%.

Restriction at Inner Harbour

	LOA in mtrs	Beam in mtrs	Draft in mtrs	Tide in mtrs
Day light arrivals	195	32.26	10.06	0.91
Night arrival restrictions	190	32.26	9.75	0.61
Departures	195	32.26	10.06 10.21	0.91 1.06

Restriction at Outer Harbour

	LOA in mtrs	Beam in mtrs	Draft in mtrs	Tide in mtrs
For arrivals				
Permitted dimensions as per berths				
OSTT	280	48.00	17.0	0.5
OB-I and OB-II	270	48.00	16.5	0.3
MPB (VCTPL)	280	42.00	14.5	
GCB for 1,00,000 DWT only	-	-	14.5	0.5
NOM	250	48.00	15.0	-
LPG	220	42.00	13.0	-
Channel berth for 10,000 DWT	150	18.75	8.5	
Fishing Harbour	70	14.00	5.5	0.7

Night Restrictions

For Arrivals

Tankers:

i. 1,14,000 DWT are being berthed at OSTT with two pilots.

ii. Vessels with 75,000 DWT and above are being berthed at OB-I and OB-II/GCB with two pilots.

iii. NOM berthing/un-berthing and double banking is restricted for day light only

For Departures

No restrictions except NOM mother tankers are handled during day light only. There are no restrictions for night navigation for vessels sailing from OB-I and OB-II/GCB OSTT & NOM Daughter vessel.

Principal navigation aids

- Six pairs of leading light beacons consisting of pylons, lead to and through the inner harbour channel
- AIS (automatic identification system) catered through VHF within port limits (11 nautical miles) used for tracking the vessel and getting the vessel details.

The work order for radar already placed and will be received by end of August, 2006. There are guidelines from Govt. to obtain license from Ministry of communications before installation of radar.

ANNEX 2.6 Statement showing the employment position (Existing strength – Class I, II, III & IV including casual labour

Sr. No.	Department	CLASS-I		CLASS-II		CLASS-III		CLASS-IV		Total	Casual	Grand total
		Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp			
1.	**ADMINISTRATION**	6	1	7	-	60	-	11	2	87	117	**204**
2.	**PERSONNEL**	13	-	3	-	46	-	12	2	76	-	**76**
3	**ACCOUNTS**	8	1	7	6	104	7	14	-	147	-	**147**
4	**ENGINEERING**	22	10	11	20	299	-	300	6	668	-	**668**
5	**MECHANICAL**	36	11	39	11	1242	243	426	70	2078	-	**2078**
6	**MATERIALS MANAGEMENT**	6	1	1	2	64	10	35	7	126	-	**126**
7	**RESEARCH & PLANNING**	10	-	2	-	26	-	7	-	45	-	**45**
8	**MARINE**	23	5	2	9	212	7	483	-	74	-	**741**
9	**TRAFFIC**	9	1	12	1	427	193	155	50	848	343	**1191**
10	**MEDICAL**	30	-	1	1	138	-	230	-	400	86	**486**
	TOTAL	**163**	**30**	**85**	**50**	**2618**	**460**	**1673**	**137**	**5216**	**546**	**5762**

Others:

- Security guards 117
- Pooled category 343
- Sanitary Pooled Khallasis 86

ANNEX TO CHAPTER 3

ANNEX 3.1 CUSTOMER ORIENTATION

The clients

Some of the major port users of Visakhapatnam Port are listed below

- HPCL
- IOCL
- MMTC / NMDC
- ESSAR (HY-GRADE PELLETS)
- ISPAT INDUSTRIES
- VIKRAM ISPAT
- COROMANDEL FERT LTD
- KRIBHCO
- INDIAN POTASH LTD
- SHRAVAN SHIPPING SERVICES PVT LTD
- INTER OCEAN SHIPPING CO LTD
- ORISSA STEVEDORES LTD
- PRATHYUSHA ASSOCIATES SHIPPING PVT LTD
- GMR INDUSTRIES
- BALCO
- ITC LTD
- TAURIAN IRON & STEEL CO LTD
- ANDHRA CEMENTS LTD
- INDIAN METALS AND FERRO ALLOYS LTD
- AVBGPR &CO
- NAGARJUNA FERTILISERS

A number of customers were met and interviewed and their feedback on port facilities and services were obtained. Results of the survey are given below both as tables and as graphs

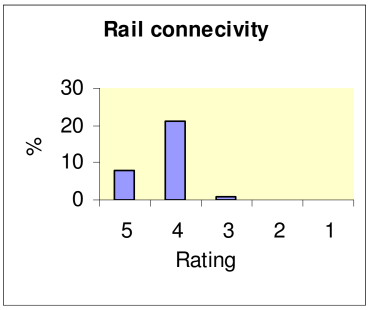
Results of enquiries

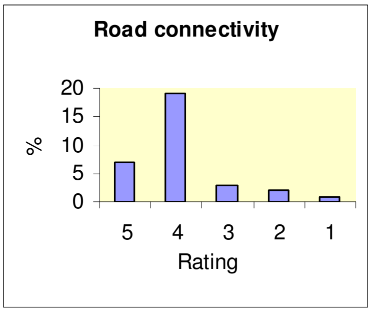
The various factors on which users expressed their opinion are given in column 2. Columns 3 to 7 are the rating scale on which respondents placed VPT with ++ indicating excellent, + indicating very good and 0 indicating good. On the flip side – indicates average and – denotes scope for improvement.

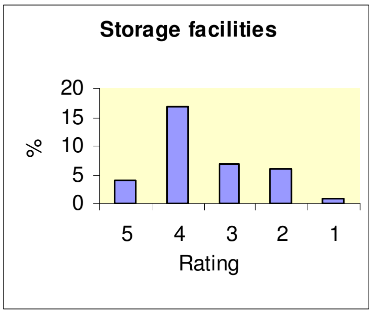
The figures in the columns 3 to 7 against various factors indicate the number of respondents who placed VPT in that position. Figures in Column 8 denote the number of respondents who assessed VPT for the respective factors. Figures in Columns 9-13 are the responses expressed in % terms.

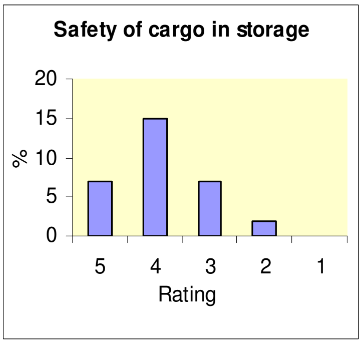
		++	+	0	-	--		++	+	0	-	--	
Sr No	Factor	5	4	3	2	1	15	33%	27%	20%	13%	7%	100%
1	Rail connectivity	8	21	1	0	0	30	27%	70%	3%	0%	0%	100%
2	Road connectivity	7	19	3	2	1	32	22%	59%	9%	6%	3%	100%
3	Storage facilities	4	17	7	6	1	35	11%	49%	20%	17%	3%	100%
4	Safety of cargo in storage	7	15	7	2	0	31	23%	48%	23%	6%	0%	100%
5	Cargo handling facilities	7	21	6	0	0	34	21%	62%	18%	0%	0%	100%
6	Safe handling of cargo	8	21	5	0	0	34	24%	62%	15%	0%	0%	100%
7	Paper work	3	20	5	5	0	33	9%	61%	15%	15%	0%	100%
8	Tariff	4	21	6	2	1	34	12%	62%	18%	6%	3%	100%
9	IT services	4	17	5	4	3	33	12%	52%	15%	12%	9%	100%
10	Customs procedures	4	20	7	4	1	36	11%	56%	19%	11%	3%	100%
11	Local taxes and levies (Octroi)	2	17	5	5	0	29	7%	59%	17%	17%	0%	100%
12	Productivity	6	23	2	1	0	32	19%	72%	6%	3%	0%	100%
13	Marine services	7	17	7	1	0	32	22%	53%	22%	3%	0%	100%

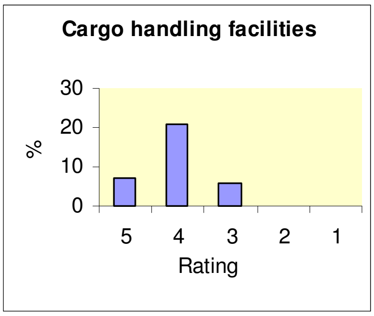
An analysis of the above shows that connectivity and productivity are rated highly by the users and the areas that need attention are storage facilities, paper work, IT services, customs and local taxation issues. The above findings are presented in charts for easy reading of the responses against various factors.

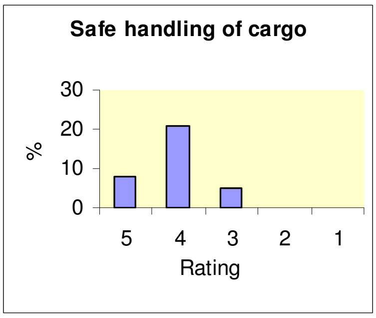


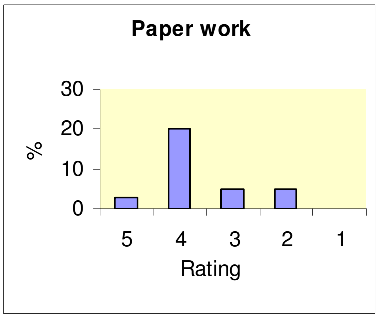


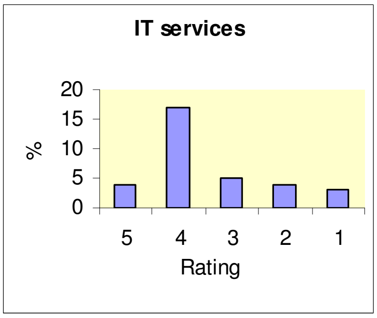


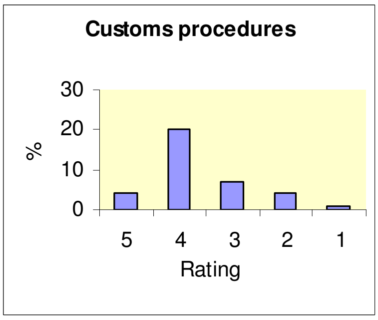

Safety of cargo in storage
%
Rating


Cargo handling facilities
%
Rating


Safe handling of cargo
%
Rating


Paper work
%
Rating


IT services
%
Rating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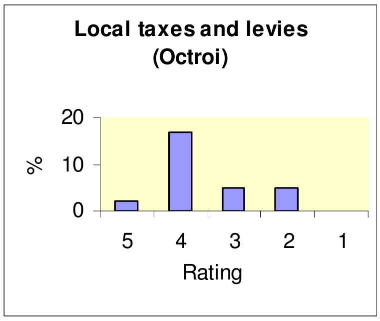
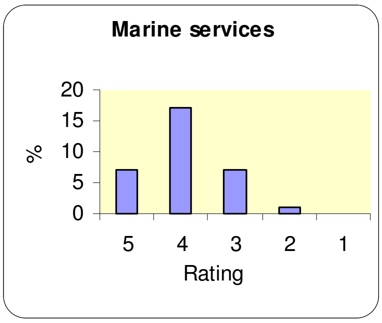
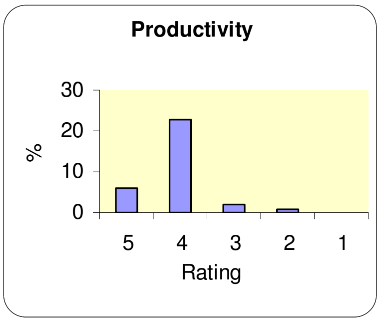
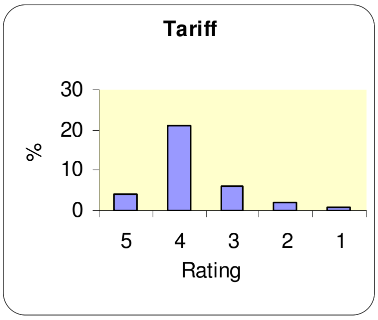
%
Rating


Local taxes and levies (Octroi)
%
Rating


Marine services
%
Rating


Productivity
%
Rating


Tariff
%
Rating

Besides rating the facilities and services the users were also requited to offer their comments / suggestions pertaining to different areas that could be addressed by VPT to improve upon the facilities / services. The same is summarised and presented in the table below:

Name of the Company	**Suggestion**	**Area**
General	High capacity cranes with grabs and conveyor system required	Handling facility
	Truck parking and moving area	Ancillary facilities
	Housekeeping should improve	Ancillary facilities
	Pollution control to be improved	Environment
	Improvement in paperwork/procedures	Process/procedures
	Adequacy of tugs and pilots	Marine
	Improving draft at strategic locations where volumes can spur immediately	Channel/Berth
	Modernisation of cargo handling facilities	Handling facility
Indian Potash Ltd	Port needs more transit sheds	Storage
	Upgradation of railway sidings with basic needs like lighting, water etc.	Road/rail facility
Shravan Shipping Services Pvt Ltd	Extra railway sidings to be provided and road infrastructure facilities to be improved	Road/rail facility
Inter Ocean Shipping Co Ltd	Evacuation of cargo from wharf is inadequate due to insufficient storage facilities	Storage
IOCL/Vizag	Delay in placement of TWs of 6-8 hours as the TWs are handed over to port railway	Road/rail facility
IOCL/Chennai	Delay in berthing/deberthing of POL vessel on few occasions due to other vessel movement. Request POL vessel to be given priority in berthing/deberthing	Marine
Orissa Stevedores Ltd	Storage facilities and railway sidings to be improved	Storage
KRIBHCO	The process of issuing Final Bill of Entry should be expedited	Process/procedures
	VPT customs should accept DDs of all nationalised banks	Process/procedures
	Payment of port dues should be accepted through electronic transfer	Process/procedures
	One/two dedicated berths should be available for urea/fertiliser	Channel/Berth
Prathyusha Associates Shipping Pvt Ltd	Increase storage areas with railway sidings	Storage
	Pollution control should be effective	Environment
	Reduce manning scales and levies	Process/procedures
	Increase facilities to importers and exporters	General
	Reduce tariff	Tariff
GMR Industries	Request more container lines and feeder vessels at vizag. Container lines are not maintaining good quantity of empty boxes	General
	Compared to Mumbai and Chennai the ocean freight are very high. Request to provide closed storage for sugar	Tariff
BALCO	We will be highly obliged if we get rake sidings outside customs area which will save our time and cost of rake loading	Road/rail facility

Name of the Company	Suggestion	Area
ITC Ltd	Ocean freight rates not competitive with Chennai	Tariff
Taurian Iron & Steel Co Ltd	Allot a plot in OHC for stacking of iron ore	Storage
Coromandel Fert Ltd	Strengthening and deepening of FB	Channel/Berth
	Extension of FB towards OR 1 so that vacant berth can be put to use	Channel/Berth
	World class bunkering facility to be made available so that large Forex is earned for the country. This would be possible with HPCL going for massive expansion	Ancillary facilities
	Tariff should be more attractive	Tariff
Andhra Cements Ltd	Give priority to our product to keep in transit godowns (T2, T4 and T)	Storage
Indian Metals and Ferro Alloys Ltd	Request to improve railway siding facilities for moderate importers of coal	Road/rail facility
	Many railway sidings are held on continuous lease basis without break giving no or little chance for moderate importers	Road/rail facility
	Storage areas to be increased	Storage
	Paper work needs to be reduces	IT
	Priority berthing for container vessels required	Marine
	Presence of mind to use un conditional methods to resolve issues on spot	General
M/s AVBGPR &Co	EDI system with link to banks, customs and trade should be introduced on urgent priority basis	IT
	Paperless working environment	IT
	Proper online computerisation should be done	IT
	Single window system for customers so that he need not run to various departments	Process/procedures
Nagarjuna Fertilisers	Railway sidings need development like lighting for night working	Road/rail facility
	Approach road to be improved and black topped	Road/rail facility
	Warehousing facilities to be strengthened	Storage
	Inadequate labour for handling huge volumes when operations are in peak	General
	Inadequate tippers for transportation of fertiliser to godown	Handling facility
	Providing leased land to the importers for constructing warehouse and providing support for establishing mechanised bagging	Storage
	Should develop sufficient roads, railway sidings and stock yards	Road/rail facility
	Railway should mobilise adequate no of empty wagons	Road/rail facility
	Should increase inner harbour draft to enable receiving Panamax vessels for discharging at inner harbour berths to avoid multiple operations	Channel/Berth

ANNEX 3.2 PERFORMANCE INDICATORS

Containers

Container terminals performance depends on:

- Ratio loaded vs. unloaded containers: empty boxes are not always included in the port statistics (they may be considered as other tare weights) but have to be handled
- Unproductive moves, i.e., the handling of all the containers that do not have to be unloaded but have to be moved: mostly empty and light containers and those containing hazardous materials, loaded on top or on the deck
- The level of automation of the gantry-cranes; one of the limiting phases of the handling cycle is the time spent positioning accurately the spreader on a container (loading), or the container on a trailer, a MAFI trailer (specialized equipment used to shift containers within port limits) or a chassis manoeuvring on the apron (unloading)
- Most modern gantries are automated and equipped with anti-sway devices, and now, the problem is more the capacity to deliver or remove containers without delaying ship-to-shore operations
- The average weight of containers and the proportion of containers requiring special attention: flats, liquid bulks, reefers etc.; and the mix of containers of various sizes: 20'/40'/45' which will require to manoeuvre or change spreaders
- Commercial constraints: most of the lines calling at a port may have similar commercial constraints, leading to unevenly distributed calls

Highest performance is observed during calls of large container-carriers loading and unloading a large number of containers, with balanced flows of full containers in and out; terminals dedicated to a single company can be highly productive (mainly East-West traffic);
Conversely, lower performances are recorded when smaller container-carriers call for a limited number of containers and have to handle many empty boxes (mainly North-South traffic);

The tables hereafter show some performances of terminals in Europe and Asia

Table 1 Major North European Terminals – Container Productivity by Category

Port / Terminal	Container Gantries (TEU per unit)	Yard Area (TEU / ha)	Berth Length (TEU / m)
Primary Terminals	127280	16809	963
Secondary Terminals	117321	16201	703
All Terminals	124390	16638	874

Table 2 Performances of a selection of terminals in Europe and Asia

Port	Terminal	Throughput Capacity (TEU / year)	Throughput 2005 (TEU / year)	Average throughput density (TEU/ha)	Average quay productivity (TEU/m)
Hamburg	Eurogate	4.000.000	2.640.000	18.857	1.288
Bremen	Eurogate	6.000.000	3.720.000	18.507	1.224
Dalian	Dalian Terminals	3.400.000	2.600.000	23.636	1.037
Singapore	Singapore Terminals	24.000.000	22.400.000	52.955	1.792
Tuticorin	Tuticorin Container Terminal	450.000	320.300	32.030	866

Sources: Port of Hamburg (2007), Port of Bremen (2007), PSA (2007)

Break Bulk / General Cargo

Due to the wide range of products, ships, equipment and methods, assuming an average performance for all kinds of commodities and packaging makes little sense:

- Specialized traffic like paper, frozen meat, fish or fruits should be studied separately, according to their packaging and to the type of ship and handling equipment (specialized or not); see appendix one, the case of fruit handling
- Most commodities in big bags, pre-slung or pre-palletized loads, pallets, nets etc., can be handled with a crane; a good organization should adapt to a rhythm of one cycle every 1.5 to 3 minutes (20 to 40 moves per hour), depending on the nature of the cargo, the unit weight of the load, the ship's size and other factors as weather conditions, tide and swell, etc. Whenever the volume of goods to be handled is large enough to allow for a reasonable cost recovery of additional equipment, special devices can be adapted to improve the unit load or to shorten the cycle

Two examples:

<u>Cements bags</u>: 2 ton pallets built in the hold or on the apron: 40 ton/hour/crane. Pre-palletized bags: 80 ton/hour/crane, and more with spreaders. Cement in bulk can be handled at much higher speed.

<u>Exotic wood</u>: logs up to 6-8 tons, handled by the piece with hydraulic clamps: 120 to 160 ton/hour/crane. Logs handled with slings; less than 100 ton/hour; only in daylight.

Table 3 General Cargo Terminals Port of Hamburg

Terminal	Commodities	Quay Length (m)	Terminal Area (ha)	Equipment	Annual Handling Capacity
Sud West	• Containers • Breakbulk cargo • Multi purpose	1300	18	• 9 multi-purpose cranes (<100t)	• 250000 TEU • 2 mln tons breakbulk
HHLA Fruit	• RoRo • Forest products • Ferrous metals • Non ferrous metals	530		• 1 container bridge • 2 mobile quay cranes (18 t)	• 1 mln tons
Reichholtz GmbH	• Green coffee • Cocoa • Nuts • Seeds • Dried fruit, etc.	440	16,5	• Mobile cranes	• 80,000 TEU

Sources: Port of Hamburg (2007)

Dry Bulk

Agri-Food Products / Fertilizers

These low-density products are transported in bulk-carriers ranging from small cargo-boats (5,000 dwt) to cape-size bulk-carriers used for basic products (100 to 130,000 dwt ships).

Handling of export products is operated mainly with conveyors, whenever possible, with performances varying from 100 to nearly 1,000 ton/hour per conveyor, depending on ship size, port equipment, product characteristics and density, brittleness, and environmental and safety considerations linked to dust.

Ship to shore operations of import products require cranes and hoppers (20 to 35 ton capacity - 150 to 300 ton/hour), or elevators (400 to 1000 ton/hour): two to three cranes per ship, or one elevator and two or more cranes on Panamax and larger ships.

On the apron, small cargoes are generally loaded in trailers; large cargoes are carried through conveyor belts to warehouses or silos. High performance may be reached only if ship to shore operations are dissociated from commercial operations. Direct delivery alongside is the major cause of poor performance in bulk handling.

Examples:

Small bulk-carrier, 1500 to 3000 t shipment: 100 - 120 ton/hour per crane. 2 cranes per vessel, operated within one day

Panamax to Cape-Size, 60,000 t shipment:1 elevator and 2 cranes per vessel results in 1,100 ton/hour, which equals 15 to 18,000 ton/day. The vessel can be handled in four days

That performance may be reduced when operating multi-product cargo-ships. Some sticky, dusty or hard-to-handle products, such as manioc roots, impair the average performance. Brittle or dusty products may require lower handling rate for quality, safety and environmental purposes.

Iron Ore / Coal

Export cargoes are usually loaded with conveyors; 1,000 to 2,000 ton/hour or more. Import traffic is handled with large gantry cranes geared with very large grabs: up to 1,000 ton/hour/gantry crane or with special devices. New developments in iron ore loading will lead to 8,000 ton /hour.

EECV in Port of Rotterdam

Unloading of coal at 3,000 ton/hour (one of the largest continuous unloaders in the world. Total unloaded in 2006 – 4.1 million ton.

EMO Bulk Terminal in Port of Rotterdam

Europe's most important dry bulk terminal. Each year, about 35 million tonnes of Coal and Iron Ore is handled in the port with the following characteristics:

- *Available quay length: 1,280m*
- *Maximum depth: 23m*
- *4 shore based cranes*
- *2 floating cranes*
- *Daily unloading capacity of 140,000 tons*
- *The biggest vessels can be leave the port again within 2 to 3 days*
- *Storage area: 160 ha*

Dekheila, Egypt

Unloading of Iron-ore pellet with a rate of 2,000 ton/hour. Unloading of Coal with 1,800 ton/hour with two gantry cranes. Annual total throughput amounts 6 million ton per year.

Reijka, Croatia

Unloading of coal 2,000 ton/hr and unloading or iron-ore 3,000 ton/hr. Total throughput 2 million ton per year.

Liquid Bulk

Generally, unloading performances depend on the size of the ship, which provides pumps and energy. They depend also on its viscosity, temperature, and on safety regulations, for hazardous products. Most liquid carriers are operated within one day, whatever the size.

Table 4 Pump Capacity Liquid Bulk Tankers

Size of Tanker (DWT)	Pump Capacity (m^3/hour)
200,000	12,000
100,000	7,000
50,000	4,500
25,000	3,500

Source: Agerschou 2004

ANNEX 3.3 SHIP DEVELOPMENT

Growth in ship size

World Fleet and Growth Trends

The following table illustrates the growth of world fleet over the last 20 years in terms of no. of ships as well as tonnage. It would be observed that while the growth in terms of numbers amounted to 18%, growth by tonnage was 51% illustrating the fact that the number of ships in the world fleet grows at less than half the rate that the tonnage in the world fleet grows, partly because the average ship gets bigger every year and partly because the industry gets more efficient every year.

Table 5 Growth of World Shipping Tonnage

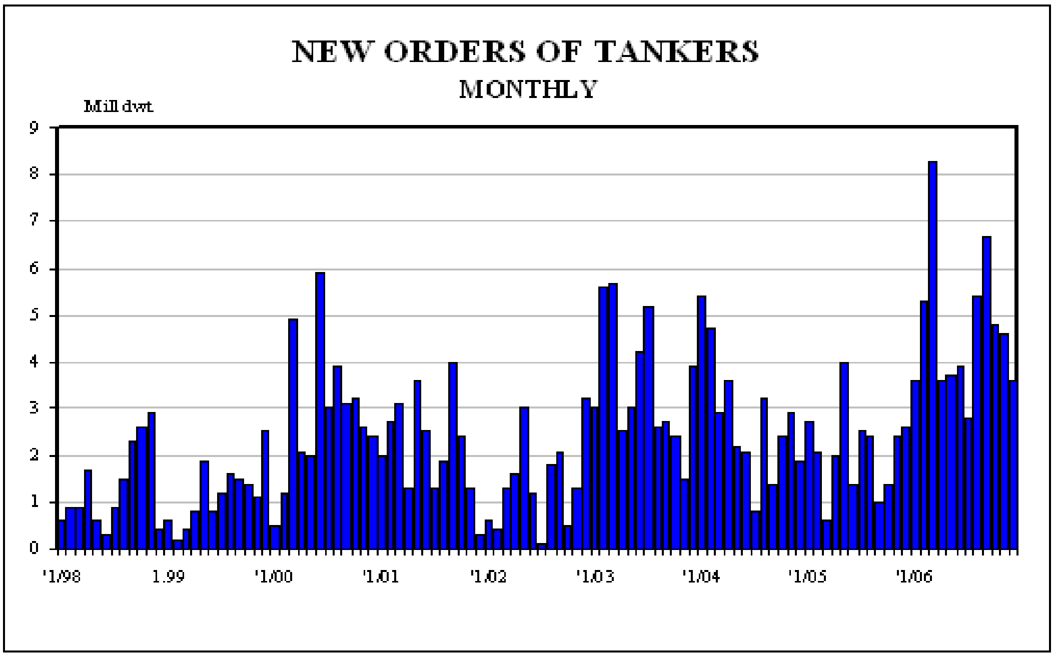
Year	# of Ships	000 GT
1984	76,068	418,682
1985	76,395	416,269
1986	75,266	404,910
1987	75,240	403,498
1988	75,680	404,406
1989	76,100	410,481
1990	78,336	423,627
1991	80,030	436,027
1992	79,845	444,305
1993	80,655	457,915
1994	80,676	475,859
1995	82,890	490,662
1996	84,264	507,873
1997	85,494	522,197
1998	85,258	531,893
1999	86,817	543,610
2000	87,546	553,054
2001	87,939	574,551
2002	89,010	585,583
2003	89,899	605,218
2004	89,960	633,321

Source: Lloyd's Register of Shipping "World Fleet Statistics"

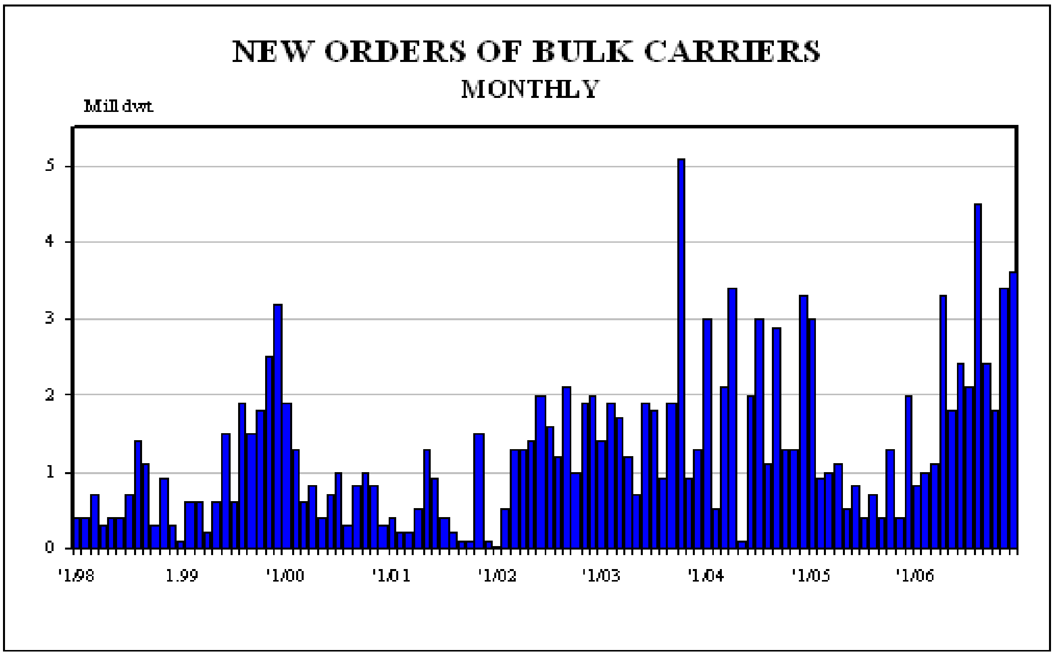
As of January 01, 2005 the total tonnage of world fleet stood at 895.8 in terms of DWT. Of this tanker fleet comprised 298.3 (33.3), dry bulk fleet 325.1 (36.3%), container fleet 131.0 (14.6) and general cargo fleet 43.6 (4.9%). The balance comprised of other vessels such as off shore vessels, passenger vessels etc

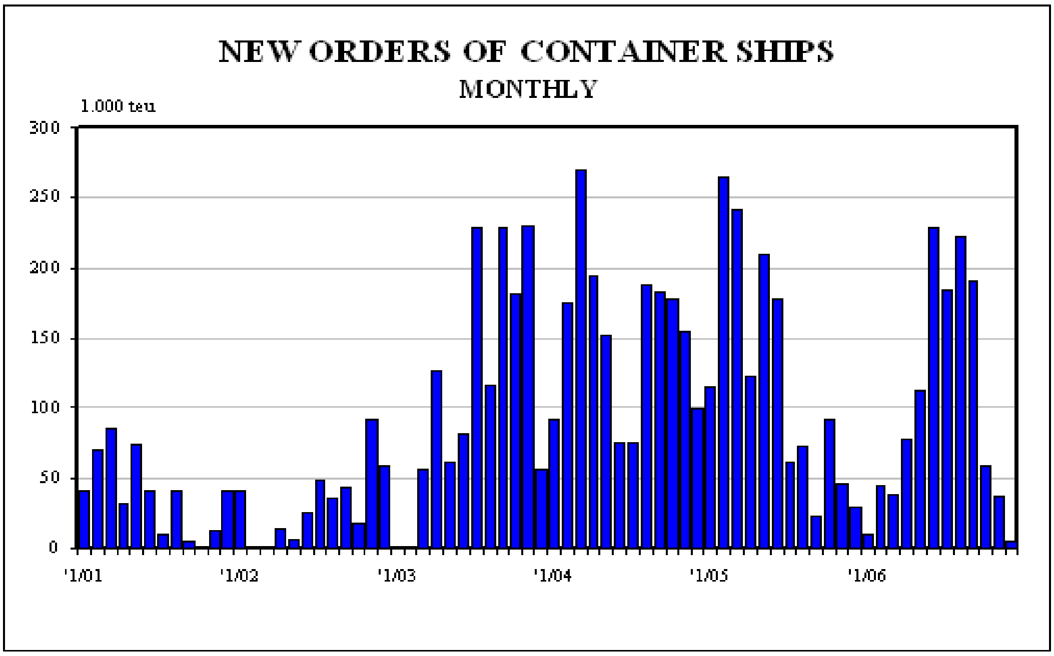
The trend observed over the last 20 years seems to continue into the future in terms of growth of ship sizes. This can be gauged from the following

Orderbook



Source: R.S. Platou


NEW ORDERS OF BULK CARRIERS
MONTHLY
Mill dwt
0
1
2
3
4
5
'1/98
1.99
'1/00
'1/01
'1/02
'1/03
'1/04
'1/05
'1/06


NEW ORDERS OF CONTAINER SHIPS
MONTHLY
1.000 teu
0
50
100
150
200
250
300
'1/01
'1/02
'1/03
'1/04
'1/05
'1/06

Future Trends

In order to understand future ship sizes, we need to look at what size of ships and how many are being built under each ship type.
New buildings of various types of ships by different sizes that are due to be delivered over the next four years i.e., 2006-10 are as under.

Table 6 Tonnage by type on order as in June 2006

T pe of Vessels	**0000 -80000 DWT**	**8 000 -120000 DWT**	**120000 - 80000 DWT**	**> 180000 DWT**	**> 300000 DWT**
Dry Bulkers	349	115	74	34	25
Oil Tankers	360	207	73	35	103
	< 10000 DWT	10000 - 15000 DWT	15000 - 20000 DWT	> 20000 DWT	> 40000 DWT
General Cargo	466	121	24	20	9
	2500 - 4500 TEUs	4500 - 6500TEUs	6500 - 8000 TEUs	8000 - 9000TEUs	> 9000 TEUs
Container ships	322	139	62	90	46

Source: Fairplay New Buildings – June 2006

It would be observed from the above that in the case of bulkers 248 vessels are of size > 80000 dwt against 348 between 50000-80000 dwt but in the case of tankers 418 ships are > 80000 dwt against 360 vessels of 50000-80000 dwt indicating a much larger growth in tonnage than seen thus far. A similar trend is observed in the case container vessels too when it is seen that 337 vessels on order are > 4500 teus compared to 322 vessels of 2500- 4500 teus
Some ship types like bulk carriers and container ships which have relevance to Visakhapatnam port are discussed below.

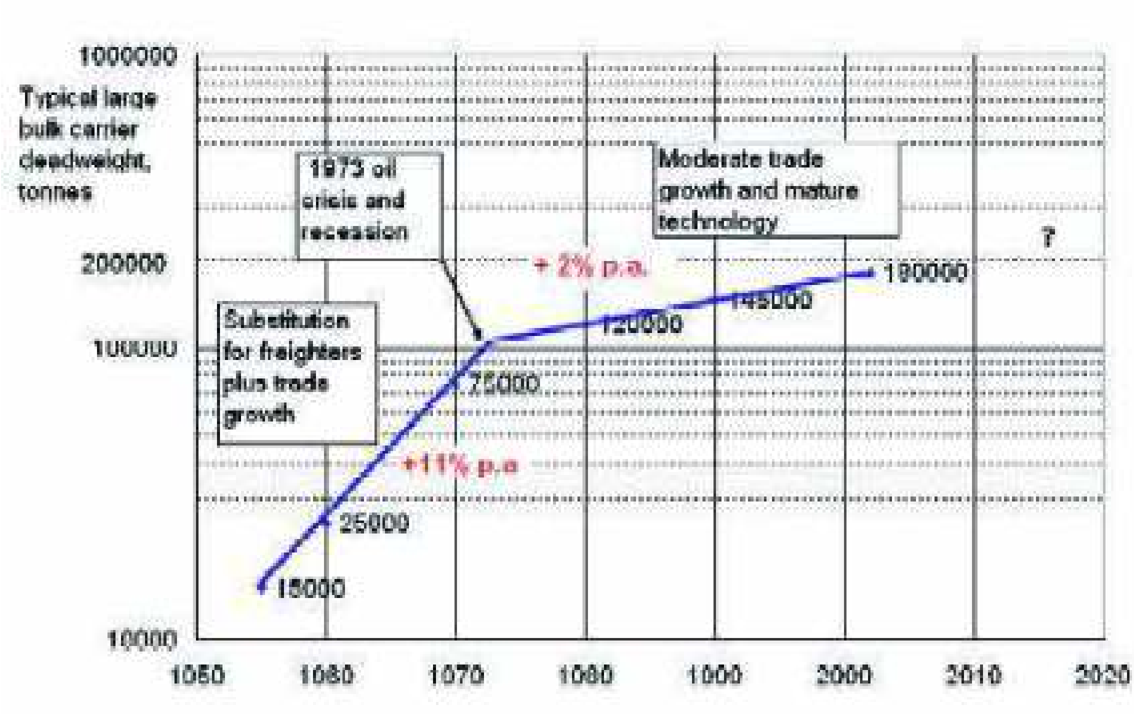
Bulk Carriers

There are two factors that drive ship size upwards:

- *Enabling technology* - the ability to design, build and operate bigger ships.
- *Economic demand* - if the shipping market is expanding, this demand can be met by more ships or larger ships, or by a combination.

Ships generally benefit from economies of scale as doubling the size of ship does not double construction, fuel, or manning costs.

The growth in ship sizes over the last 50 years and the factors responsible can be seen from the following chart.



source: rina.org.uk

Rapid increase in size of bulkers seen in the 1960s i.e., doubling in seven years, or 11% annually was partly due to expansion of trade, especially in the steel industry with its need for iron ore and coking coal and partly due to taking over cargoes such as grain from tweendeckers. Once that substitution was complete, and with the recession brought on by the quadrupling of oil prices following the 1973 Arab Israeli war, bulker size growth dropped to around 2% annually resulting in doubling taking 40 years. Although a handful of ships have been built above 250,000 dwt (sometimes combination carriers), the most popular large bulker today is the Capesize around 170,000 dwt - 180,000 dwt.

Visakhapatnam port, which is a bulk cargo port, therefore needs to gear itself to receive 200, 000 dwt dry bulk carriers.

Likewise it needs to increase its capacity to handle liquid bulk vessels of 300,000 dwt from the current 200,000 dwt and in the case of containers capacity to receive 4,500 TEU vessels even though it may not be a major container port. Different sizes of container ships, their growth and trends are given below.

Container Ships

Table 7 Five Generations of Container ships

Generation	Year (period)	Length (M)	Draft (M)	Size (TEU)
First	1956-1970	135-200	< 9	500-800
Second	1970-1980	215	10	1000-2500
Third	1980-1988	250-290	11-12	3000-4000
Fourth	1988-2000	275-305	11-13	4000-5000
Fifth	2000-?	335	13-14	5000-8000

The first containerships were modified bulk vessels or tankers that could transport up 1,000 TEUs. Indeed, the container was at the beginning of the 1960s an experimental transport technology and modifying existing ships proved out to be the least expensive solution. These ships were carrying onboard cranes. Once the container was massively adopted at the beginning of the 1970s, the construction of the first containerships (second generation) entirely dedicated for handling containers started. They carry the cellular denomination since they are composed of cells lodging containers up to stacks of 12. Cranes were removed from the ship design so more containers could be carried. Containership speeds have peaked to an average 20-25 knots and it is unlikely that speeds will increase due to energy consumption.

Economies of scale pushed the construction of larger containerships in the 1980s until the Panamax (1985) and Post Panamax (1988) standards, transporting between 4,000 and 5,000 TEUs were reached. The fifth generation (Post Panamax Plus) are now in service and will be able to transport between 5,000 and 8,000 TEUs. A limited number of harbours are able to handle them, because these ships will require deep water ports and highly efficient, but costly, shore infrastructures

Groups or classes of Container ships

Depending on the TEU size and hull dimensions, container vessels can be divided into the following main groups or classes. However, adjacent groups will overlap.

- Small Feeder <1,000 teu
- Feeder 1,000-2,500 teu
- Panamax 2,500-4,500/5,000 teu
- Post-Panamax 4,500/5,000-10,000 teu
- Suezmax 10,000-12,000 teu
- Post-Suezmax >12,000 teu

Small Feeder

The small feeder container vessels are normally applied for short sea container transportation. The beam of the small feeders is, in general, less than 23 m.

Feeder

The feeder container vessels greater than 1,000 teu are normally applied for feeding the very large container vessels, but are also servicing markets and areas where the demand for large container vessels is too low. The beam of the feeders is, in general, 23-30 m.

Panamax

Until 1988, the hull dimensions of the largest container ships, the so-called Panamax-size vessels, were limited by the length and breadth of the lock chambers of the Panama Canal, i.e. a max. ship breadth (beam) of 32.3 m, a max. overall ship length of 294.1 m (965 ft), and a max. draught of 12.0 m (39.5 ft) for passing through the Canal. The corresponding cargo capacity was between 4,500 and 5,000 teu. These max. ship dimensions are also valid for passenger ships, but for other ships the maximum length is 289.6 m (950 ft). However, it should be noted that, for example, for bulk carriers and tankers, the term Panamax-size is defined as 32.2/32.3 m (106 ft) breadth, an overall length of 225.0 m for bulk carriers and 228.6 m (750 ft) for tankers, and no more than 12.0 m (39.5 ft) draught. The reason for the smaller length used for these ship types is that a large part of the world's harbours and corresponding facilities are based on these two lengths, respectively.

Post-Panamax

In 1988, the first container ship was built with a breadth of more than 32.3 m. This was the first post-Panamax container ship. The largest vessels on order with a capacity of approx. 9,600 teu have exceeded the Panamax beam by approx. 13 m.

Suezmax

It is probable that Ultra Large Container Ships (ULCS) carrying some 12,000 teu containers can be expected. This ship size, with a breadth of 50 m / 57 m, and corresponding max. draught of 16.4 m /14.4 m for passing through the Suez Canal, may just meet the present Suezmax size.

Post-Suezmax

It is possible that in about 10 years the ULCS will perhaps be as big as 18,000 teu, with a ship breadth of 60 m and a max. draught of 21 m. Today, this ship size would be classified as a post-Suezmax ship, as the cross-section of the ship is too big for the present Suez Canal. It is claimed that the transportation cost per container for such a big ship may be about 30% lower than that of a typical 5,000-6,000 teu container vessel of today.

A draught of 21 m is the maximum permissible draught through the Malacca Strait. The name "Malaccamax" has therefore been used.
With the intended increase of the cross- section breadth and depth of the Suez Canal over the coming ten years, the 18,000 teu container ship will also be able to pass the Suez Canal. On the

other hand, a future container ship with a draught of 21 m would require existing harbours to be dredged. Today, only the harbours of Singapore and Rotterdam are deep enough.
The following graph shows how container ship sizes have grown and how future sizes are poised.

Source: Solentwaters.co.uk

Table 8 Frequency distribution of panamax vessels deployed in bulk trade in terms of Draft

S.No.	Draft	No. of vessels
1	Up to 12.0 mts.	20
2	12.0 to 12.5 mts.	177
3	12.5 to 13.0 mts.	96
4	13.0 to 13.5 mts.	312
5	13.5 to 14.0 mts.	234
6	14.0 above	138
	Total	977

Table 9 Frequency distribution of bulk cape size/ panamax vessels in terms of dwt

Range	No. of Vessels	% of share
60.000 to 80.000 dwt	1,000	60.50
80.001 to 100.000 dwt	73	4.40
100.001 to 150.000 dwt	186	11.20
150.001 to 200.000 dwt	342	20.70
200.001 to 250.000 dwt	38	2.30
250.001 to 300.000 dwt	7	0.40
300.001 dwt above	8	0.50
Total	1,654	100

Summary

It would be observed that while the growth in the world fleet in terms of quantity mounted to 18%, growth by tonnage was 51%, illustrating the fact that the average ship gets bigger every year and the industry is improving the efficiency.

As of January 01, 2005 the total tonnage world fleet stood at 895.8 in terms of DWT. Of this tanker fleet comprised 298.3 (33.3%), dry bulk fleet 325.1 (36.3%) container fleet 131.0 (14.6%) and general cargo fleet 43.6 (4.9%). The balance comprised of other vessels such as offshore vessels, passenger vessels etc.

In order to understand future ship sizes, we need to look at what size of ships and how many are being built under each ship type. It would be observed from the above that in the case of bulkers 248 vessels are of size >80000 dwt against 348 between 50000-80000 dwt, but in the case of tankers 418 ships are >80000 dwt against 360 vessels of 50000-80000 dwt, indicating a much larger growth in tonnage than seen thus far. A similar trend is observed too in the case container vessels, when it is seen that 337 vessels on order are >4500 teu compared to 322 vessels of 2500-4500 teu.

ANNEX TO CHAPTER 7

ANNEX 7.1 Road traffic estimation

Cargo volume in tons	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	20012-13
Import	3,462,984	4,005,670	2,448,664	1,175,500	1,324,752	1,047,899	1,108,848	13,809,107	
Export	91,283	71,835	137,771	270,287	433,351	497,254	4,390,087	2,609,149	

Average daily traffic (ADT)		
Avg payload per truck	10	Tons
No of working days per year	330	

In terms of truck vehicles								
Import	1,049	1,214	742	356	401	318	336	4,185
Export	28	22	42	82	131	151	1,330	791
Total	1,077	1,236	784	438	533	468	1,666	4,975

Assuming that each truck trip has a half trip (empty move) associated with it

Growth rate - truck traffic	7.00	% for period 2005-6 to 2012-13
Growth rate - other traffic	6.00	% for period 2005-6 to 2012-13

Trucks /day (both directions)	1,616	1,853	1,176	657	799	702	2,500	7,463	11,984
Trucks/day (one direction)	808	927	588	329	400	351	1,250	3,731	5,992

Traffic composition - Truck (commercial vehicles) : Other vehicle (car/van/jeep/two and three wheelers etc.) is 75 : 25

Other vehicle trips	269	309	196	110	133	117	417	1,244	1,997

Cargo volume in tons	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	20012-13
In terms of PCUs									
PCU conversion factor	3.7	truck							
PCU conversion factor	1.0	others							
Truck traffic (PCU/direction) daily	2,989	3,429	2,175	1,216	1,478	1,299	4,624	13,806	22,170
Other traffic (PCU/direction) daily	269	309	196	110	133	117	417	1,244	1997
Total traffic (PCU/direction) daily	3,258	3,738	2,371	1,325	1,612	1,416	5,041	15,050	24,167
Peak hour traffic =	10		% of daily traffic						
PCU/direction in peak hour	326	374	237	133	161	142	504	1,505	2,417

ANNEX 7.2 Port connectivity - traffic estimation

Cargo volume in tons										
	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	20012-13	20016-17
Import	3,462,984	4,005,670	2,448,664	1,175,500	1,324,752	1,047,899	1,108,848	13,809,107		
Export	91,283	71,835	137,771	270,287	433,351	497,254	4,390,087	2,609,149		
Average daily traffic (ADT)										
Avg payload per truck	10	tonnes								
No of working days per year	330									
In terms of truck vehicles										
Import	1,049	1,214	742	356	401	318	336	4,185		
Export	28	22	42	82	131	151	1,330	791		
Total	1,077	1,236	784	438	533	468	1,666	4,975		
Assuming that each truck trip has a half trip (empty move) associated with it										
Trucks /day (both directions)	1,616	1,853	1,176	657	799	702	2,500	7,463	10,663	13,994
Traffic composition - Truck (commercial vehicles) : Other vehicle (car/van/jeep/two and three wheelers etc.) is 75 : 25										
Other vehicle trips	539	618	392	219	266	234	833	2,488	3,554	4,665
In terms of PCUs										
PCU conversion factor – truck	3.7									
PCU conversion factor - others	1.0									
Total traffic (PCU/day)	6,516	7,475	4,742	2,651	3,223	2,833	10,081	30,100	43,008	56,443
Peak hour traffic as % of daily traffic	8									
Traffic (PCU/peak hour)	521	598	379	212	258	227	807	2,408	3,441	4,515

** Annual cargo traffic received / dispatched by road from VPT Administrative Reports

Growth factors			
Year	2006	2013	2017
Cargo (Mt)	56	80	105
CAGR (%)	-	5.23%	3.96%

ANNEX 7.3 Outer harbour connectivity - traffic estimation

Traffic forecast in terms of TEU in 2012-13	**400000**
Road share of container traffic	35
No of TEU per year by road	140,000
Avg. No. of TEU per truck	1.5
No of working days per year	330
Trucks per day	283
Assuming that each truck trip has an half trip (empty move) associated with it	
Trucks/day (both directions)	424
Traffic composition - Truck (commercial vehicles) : Other vehicle (car/van/jeep/two and three wheelers etc.) is 75 : 25	
Other vehicle trips	141
In terms of PCU	
PCU conversion factor – truck	3.7
PCU conversion factor – other	1.0
Total traffic (PCU/ day)	1,711
Peak hour traffic as % of daily traffic	8
PCU/ peak hour	**137**

ANNEX 7.4 Railway requirement calculation

Import / Export	ity	Traffic forecast MT 2012/13	Modal share (%)				Modal share (T)				Existing traffic No of rakes/day	Payload per rake (T)***	No of working days***	No of rake Per day required
			Rail	Road	Pipe line	Total	Rail	Road	Pipe line	Total				
	POL	28.1												
Exp	POL	5.3	0	0	100	100	0	0	5.3	5.3		NA	NA	
Imp	Crude oil	15.0	0	0	100	100	0	0	15.0	15.0		NA	NA	
Imp	Oil products + LPG	2.6	20	0	80	100	0.5	0	2.1	2.6	2	2,700	330	1
Tranship	POL	5.2	0	0	0	0	0	0	0	0		NA	NA	
Exp	Iron Ore & Pellets	14.25*	100	0	0	100	14.25	0	0	14.25	10	3,410	300	14
Exp	Thermal Coal	2.7	100	0	0	100	2.7	0	0	2.7	2	3,410	300	3
Imp	Coking Coal	6	100	0	0	100	6.0	0	0	6.0	2	3,410	300	6
Imp	Steam Coal	2.3	100	0	0	100	2.3	0	0	2.3	2	3,410	300	2
	Other Dry Bulks	6.8												
Exp	Alumina	3	100	0	0	100	3.0	0	0	3.0	1	2,650	240	4.5
Imp	Lime stone	0.3	100	0	0	100	0.3	0	0	0.3	0.5	2,650	240	1
Imp	Coke	3.9	100	0	0	100	3.9	0	0	3.9	2	3,410	300	3.5
Imp	Fertilizer & RM	5.5	95	5	0	100	5.2	0.3	0	5.5	4	2,200	240	10
Imp	Other Liquids	1.4	100	0	0	100	1.4	0	0	1.4	0.5	2,700	330	1
Exp/Imp	General Cargo	5.2	25	75	0	100	1.3	3.9	0	5.2	0.5	3,410	240	1
Exp/Imp	Containers (MT)	2.5	90	10	0	100	2.25	0.25	0	2.5				
	Containers (TEU)	220,000	90	10	0	100	198,000	22,000	0	220,000	Negligible	90	300	7
Exp	Steel cargo	1	100	0	0	100	1	0	0	1	0.5	2,430	240	2
	TOTAL	**75.75****									**27**			**56**

Assumptions:

*For Iron ore traffic: Forecasted traffic = 23 MT, -5 MT for probable shift to Gangavaram = 18 MT, 9 Mt of pellets on a/c of Hygrade/Essar as they are transported using conveyor to the berth = remaining 9 MT as iron ore export

1. Hygrade has 267 KM pipeline of 8 MT capacity from mines to transport ore fines in slurry form operates at 80% efficiency, 80 % of 8 MT = 6.4 MT
2. Assuming 1 MT slurry is used to produce 0.75 MT of pellets, 6.4 MT slurry will produce 4.8 MT pellets
3. For remaining 9-4.8 = 4.2 MT pellets about 5.25 MT of fines required assuming 1 MT fines produce 0.8 MT pellets which added to 9 MT = 14.25 MT

** Difference in iron ore traffic 18 – 14.25 = 3.75 added to 75.75 = 79.5

*** Payload per rake and no of working days are taken from IPA report, 2001, on VPT Rail System Study

Proposed segregation of rail traffic

Yard	Commodity	Estimated Traffic (rakes/day)
Ore exchange yard	Iron ore	14
Existing R & D Yard	Thermal coal, other coals, alumina, steel, containers, half of GC	28.5 say 28
Proposed Mindi yard	POL, Lime Stone, Fertilisers, FRM, Other liquids, half of GC	13.5 say 14

ANNEX TO CHAPTER 9

ANNEX 9.1 Comparison of tariff charges

Consultants have compared the tariffs of Visakhapatnam with the following ports.

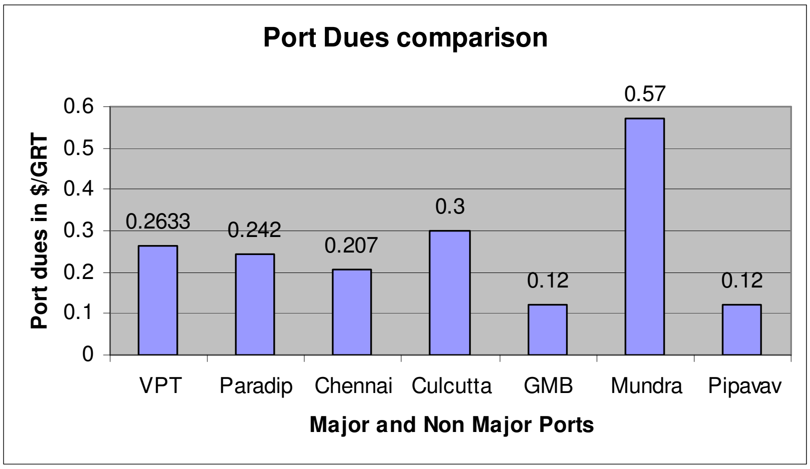
1. Major Ports:
   a. Paradip Port Trust
   b. Chennai Port Trust
   c. Calcutta Port Trust
   d. Visakhapatnam Sea Port Private Ltd. (VSL) a BOT terminal in VPT

2. Non Major Ports:
   a. Gujarat Maritime Board (GMB)
   b. Mundra Port
   c. Gujarat Pipavav Port Ltd.

For the purpose of comparison, the following charges and services offered by the port are considered.

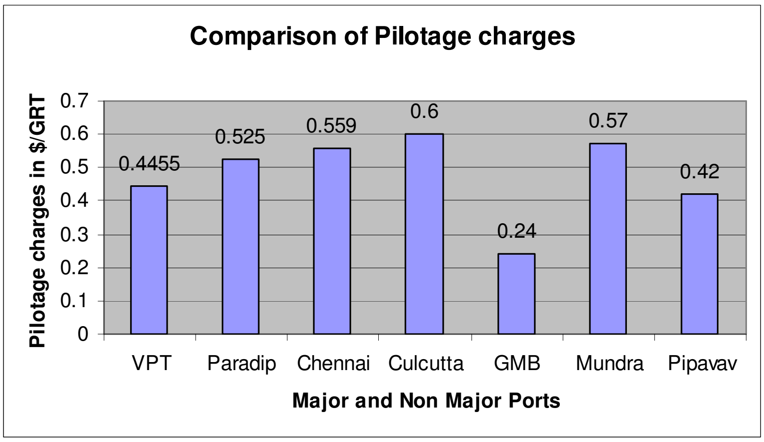
- Port dues
- Pilotage and towage
- Berth hire charges
- Wharfage on selected cargos
- Free period for cargo storage
- Demurrage on cargo storage

Port Dues



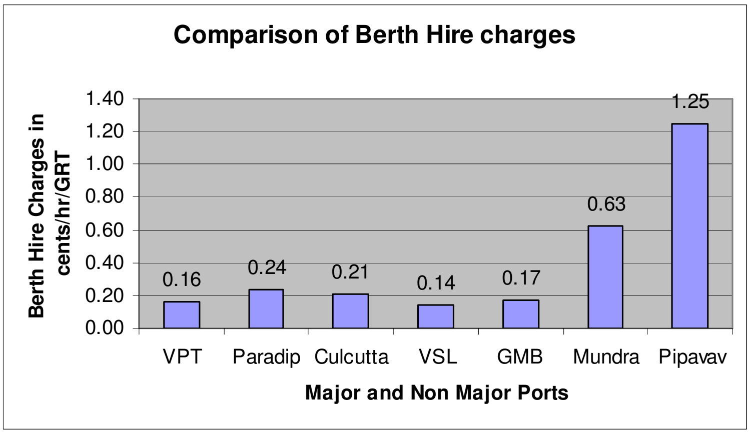
Among major ports compared port dues are seen maximum at Kolkata and minimum at Chennai. Though the Gujarat maritime board has pegged the charges at 0.12 $ /GRT and is followed at Pipavav the charges at Mundra are as high as 0.57 $/GRT. Essentially the cost incurred by port is the conservancy, dredging, maintenance of navigation channel and navigational aids. It is observed that the navigation comparatively at VPT is more visible and does not require the fancy technology like VTMS.

Pilotage and towage charges



All ports in India presently follow a composite charge for pilotage, towage as well as mooring. Though Gujarat Maritime Board has provided the facility to charge separately for pilotage and towage, the ports like Mundra and Pipavav taken for comparison still follow the composite charge. Essentially every ship docking undocking have to use these services of port. Among the major ports compared Kolkata charges maximum and VPT charges minimum. Though GMB has pegged the charges at 0.24 $/GRT both Mundra as well as Pipavav charges are on the higher side.

Berth Hire charges



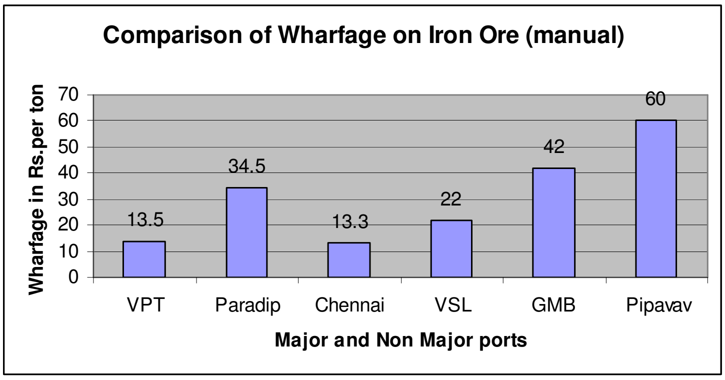
Major ports in India have recently started charging the berth hire on hourly basis. Paradip and Calcutta still charges on shift (8 hrs.) basis. The non major ports as taken for comparison are charging on day basis. For the purpose of comparison all the berth hire charged at various ports are converted on hourly basis. The Chennai has exception in this, Berth hire charges has two components the Minimum fixed and the variable component on basis of GRT and is charged on hourly basis the maximum rate charged is (8.747 + 0.0026 per GRT)/Hr in $. Interesting to note is that VSL which will operate within VPT will be charging less than VPT. The charges at non major ports are quite on higher side. Some of the international ports like port of Rotterdam has the concept of charging the berth hire charges on the basis of length of quay utilized, irrespective of the size of the ship. These charges also vary from quay to quay as the cost and facilities differ for every quay/berth. It is therefore recommended to evolve a similar case for Visakhapatnam.

Wharfage charges

Wharfage is the essential charge once the cargo touches the port. This charge covers the shore handling and transfer of cargo from ship side to stack area and vice a versa. This charge has to be in consonance with the automation of cargo handling as well as the performance by port.

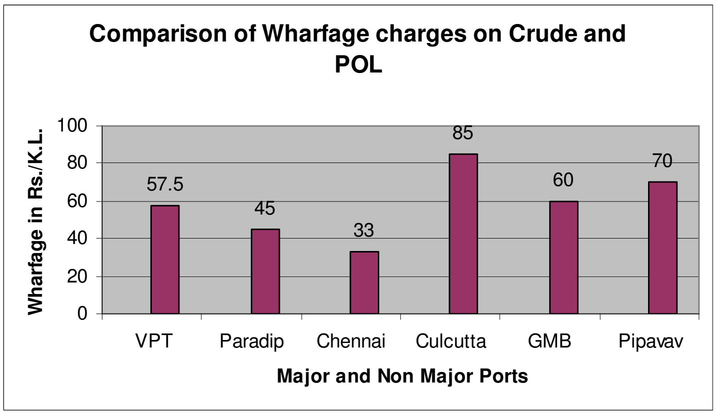
Many a times the cost of handling manually is more than that compared to mechanical handling, the most obvious reason being labour charges and the misery on this is poor performance in manual handling. For the purpose of comparison few of the cargos, which make a major pie of cargo type, are studied.

a. Wharfage on Iron Ore handled manually



Charges at non major ports like Pipavav is quite higher compared to that at Major ports. Till recently Paradip did not have classification of cargo as 'Iron Ore by manual operation' for recovering the wharfage and therefore this cargo fall in tariff item of 'Other cargo' and was subsidised. Charges proposed at Rs. 34.5/Ton is similar to handling by mechanical means and could not be justified on cost as well as performance front. The port users who deal with small parcel size are worst hit as they have no choice but to handle the vessels by manual means and are hit not only by higher handling cost but also the performance.

b. Wharfage on crude and POL

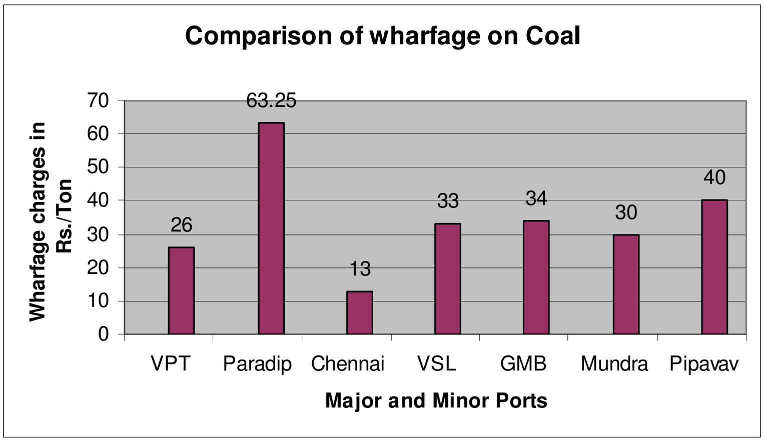


There is vast variation observed in wharfage charges for crude and POL. Important point to note is VPT do not have classification as per 'Flash point' of cargo. In case of Paradip and Calcutta if the cargo has flash point below 23 degrees c. the charges are as high as Rs. 150 and Rs. 175 respectively at Paradip and Calcutta. Visakhapatnam shall leverage on the flash point of cargo handle and shall differentiate the charges as safety compliance differs for handling cargo of such a lower flash point.

c. Wharfage on Coal

Handling of coal by conventional system may also vary from port to port. Some of the ports may use hoppers to feed the trucks and keep the surrounding clean as well as prevent pollution of dock basin, however the performance is relatively on the lower side. Dumping of sling directly on

wharf or on truck can boost the performance but is not desirable on environment front. The cost of handling cargo will definitely vary in both the cases.
Interesting to note here is VSL which will operate within VPT will be charging higher than VPT. The wharfage at Paradip is higher due to the mechanization, VPT can use these figures for estimating the revenues in view of mechanization of coal handling, and however the tariff is depended on much conditionality.

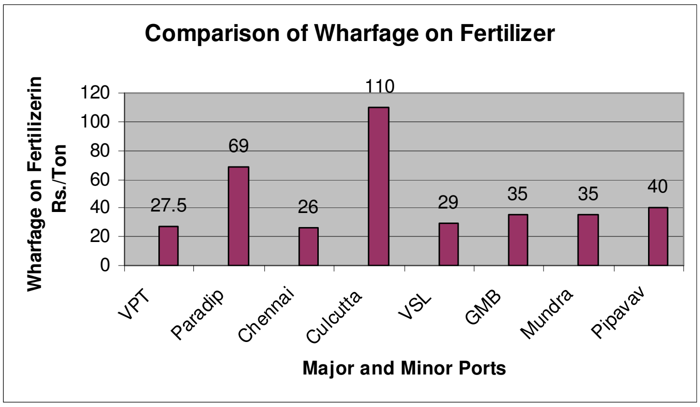


d. Wharfage on Allumina

This commodity could not be compared with other major and non major ports as all these ports taken for comparison do not have separate tariff item for recovering wharfage on alumina. Interesting to note is VSL which will be operating within VPT will be charging Rs. 36/ton compared to Rs. 30/ton being charged by VPT.

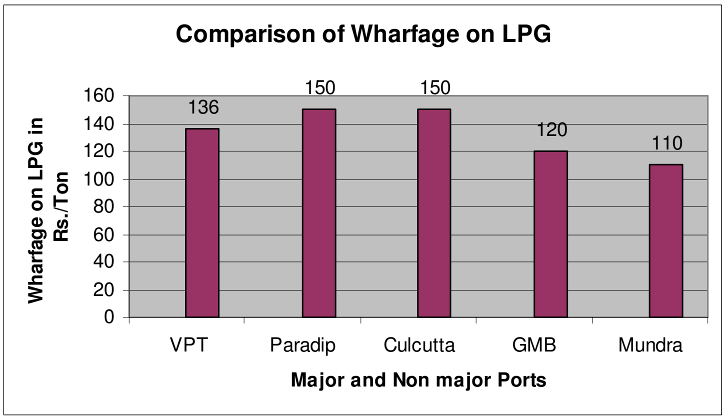
e. Wharfage on Fertilizer

Handling of fertilizers vary from port to port. Many of the ports continue to handle with the conventional wire sling system. Some of the ports like one of the berth at VPT has automated the handling and the equipment for same is installed and maintained by the private user. The cost of handling therefore varies from port to port and has observed vast variation as shown below. The wharfage at Paradip and Calcutta is higher due to the mechanization, VPT can use these figures for estimating the revenues in view of mechanization of fertilizer handling, and however the tariff is depended on much conditionality.



f. Wharfage on LPG

Though there is hardly any difference in technology of handling this cargo still there is variation observed across the ports as shown below.



g. Wharfage on Iron Ore handled mechanically

VPT has a composite charge of Rs. 95 per ton (Wharfage (26.2)+Handling (36.5) +tippling (32.3)). The charges at Paradip includes wharfage and tippling at the rate of Rs. 24.5 and Rs. 32.3 and therefore composite charge of Rs. 56.8/ton is charged. The wharfage component at VPT is higher than that charged at Paradip.

Free period for storage of cargo

Free period of 3 days for import, 10 days for transhipment and 30 days for export is almost similar across the ports. There is difference seen at Paradip port where the free days for export are only 5 days with an exception of 30 days for rice cargo. Port transit area shall be planned for the stacking of cargo for the sailing vessels and shall discourage the use of transit area as the warehouse for the cargos. As in case of project cargo where the delivery process takes time looking at planning of logistics as considered in VPT where the free period is 10 days, similar steps shall be taken for few commodities in export instead of blanket free period for all commodities in export, specially looking at the paucity of space.

Demurrage on cargo storage

Cargo stored beyond the free period without specific reasons reckoned like ‘custom detention’ attracts demurrage on daily basis. There is pattern across the ports including slabs of days and varying charges for each slab. The exception is observed at Calcutta where the demurrage is charged at the flat rate after free period and is quite on the higher side compared to other ports, the charges are Rs. 100/ton/day for import and Rs. 50/ton/day for export. The maximum charge at VPT does not exceed Rs. 36/ton/day both for import as well as export. The concept of charging demurrage has always been on the basis of tonnage of cargo instead of the area occupied by the cargo as it becomes tedious to arrive upon such measure, the point to bring here is the opportunity cost of land varies from port to port and hence could be the reason of such high cost at Calcutta being the metropolis.

ANNEX 9.2 Comparison of tariff with other major, non major and private ports in India

Consultants have compared the tariffs of Visakhapatnam with the following ports.

1. Major Ports:
   a. Paradip Port Trust
   b. Chennai Port Trust
   c. Calcutta Port Trust
   d. Visakhapatnam Sea Port Private Ltd. (VSL) a BOT terminal in VPT

2. Non Major Ports:
   a. Gujarat Maritime Board (GMB)
   b. Mundra Port
   c. Gujarat Pipavav Port Ltd.

For the purpose of comparison, the following charges and services offered by the port are considered.

1. Port dues
2. Pilotage and towage
3. Berth hire charges
4. Wharfage on selected cargos
5. Free period for cargo storage
6. Demurrage on cargo storage

Comparison of tariff with international ports

The previous sections have compared the tariff of Visakhapatnam port with other major and private ports in India. This has helped to analyse the competitive position of Visakhapatnam port with other competing Indian ports. The effort in this section is to compare the tariff of Visakhapatnam port with the neighbouring international ports to analyse its competitive position in the global market. Following ports are considered for the study. Annex 3.2 provides tariff comparison details of selected international ports.

1. Ports in China
2. Dubai port
3. Port Kembla of Australia
4. Port Johar of Malaysia
5. Port Palembang of Indonesia and
6. Visakhapatnam Port

The purpose of taking these ports is the relationship of Visakhapatnam port with these countries in terms of cargo flows and also the availability of information. The efforts are made to compare the vessel related charges as they form the major component of revenue and are the services which shall continue to be with the port even as a landlord. For the purpose of comparison the tariff rates are converted in rupee for all the ports. A note of caution that this may not provide the true picture as factors like conditions of services, price parity, etc., are not considered in the analysis. However one gets a fairly good idea in terms of cost comparison and the basis on which tariff is charged.

As the basis on which the tariff is charged is not the same at all the ports, one sample vessel was considered and the total vessel related charges were calculated for each port for the purpose of comparison, with an assumption of total stay of vessel at berth as 48 hours. Efforts are also made to analyse tariff components of vessel related charges. Following paragraphs describe the tariff components of each of the above ports and the graphical presentation is annexed at the Annexure ?.

Sample vessel details: Major Dhansingh Thapa PVC

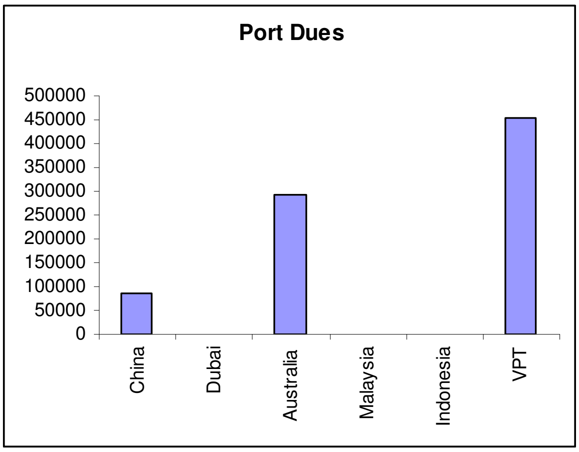
GRT	37,855	tons
NRT	21,210	tons
LOA	228.61	mt
Beam	32.24	mt
Vessel stay	48	days
DWT	67,227	tonnes
Time taken for berthing at OSTT berth	195	min
Time taken for unberthing at OSTT berth	120	min

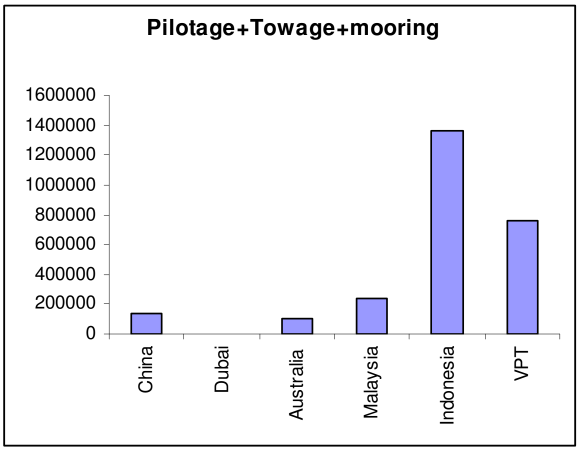
Summary of tariff comparison

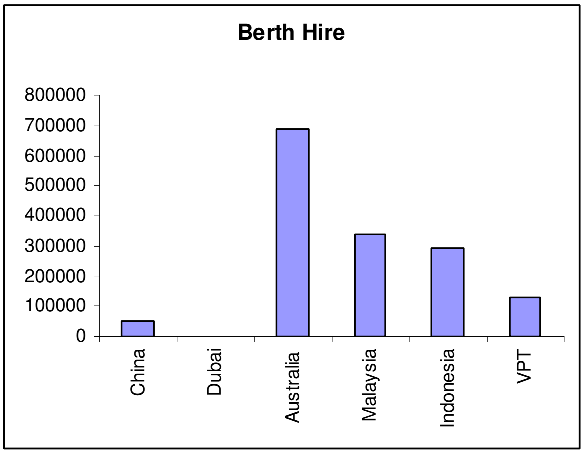
S. No.	Country/Port	Currency/ Conversion rate INR	Total vessel related charges INR	Rank
1	China	RMB/ 5.724	270,797	1
2	Dubai	Dirham/12.359	654,990	3
3	Australia/ Kembla	Australia Dollars/34.625	1,080,739	4
4	Malaysia/ Johar	RM/12.359	582,094	2
5	Indonesia/Palembang	US Dollars/45.36	1,660,960	6
6	India/ Visakhapatnam	US Dollars/45.36	1,378,695	5

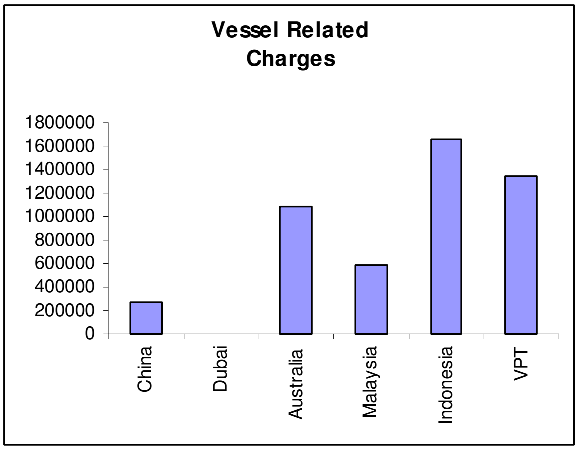
ANNEX 9.3 Comparison of tariff charges of international ports

Port	Port Dues	Pilotage	Towage	Mooring	Berth Hire	Vessel Related Charges
China						
In RMB	0.71	0.5	0	213	0.2	
In INR	4.06404	2.862	0	1219.212	1.1448	
In INR	86198	121406	0	14631	48562	270797
Dubai						
	0.18	2000	1500	1350	1.4	
	2.22462	24718	18538.5	16684.65	17.3026	654900
Australia						
	20325+ 0.973 * (GRT-50000)	3015+ 0.0071 * (GRT-50000)	NA	NA	412	
	34.625* {20325+ 0.973 * (GRT-50000)}	34.625*{3015+ 0.0071 * (GRT-50000)}	NA	NA	0	
	294587	101409	0	0	684744	1080739
Malaysia						
	0	2	1500+375	0	2.5	
	0	24.718	18538+ 4635/15 min	0	30.8975	
	0	11302	231746	0	339047	582094
Indonesia						
	0	145+0.004	375+0.004	0	0.086	
	0	6577+0.1814	17010+0.18 14	0	3.90096	
	0	672376	693242	0	295342	1660960
VPT						
	0.2633/GRT	0.4455/GRT	Included in Pilotage	Included in Pilotage	0.0016/GRT/ Hr	
	452113	764969	0	0	131873	1348956


Port Dues
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
China
Dubai
Australia
Malaysia
Indonesia
VPT

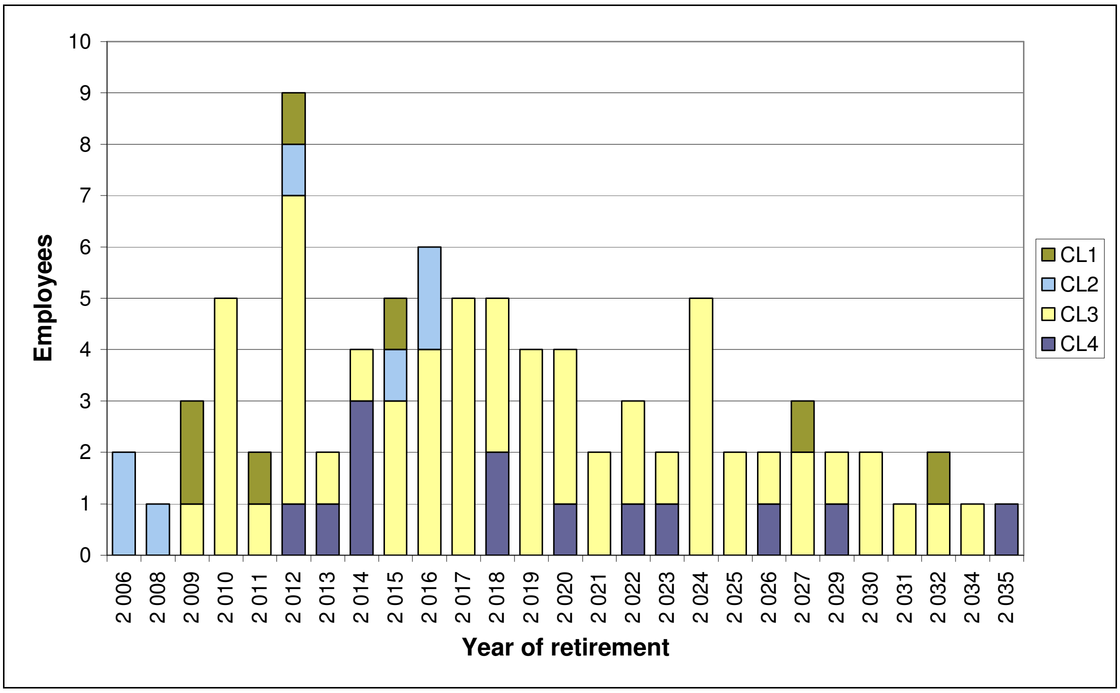

Pilotage+Towage+mooring
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
China
Dubai
Australia
Malaysia
Indonesia
VPT


Berth Hire
800000
700000
600000
500000
400000
300000
200000
100000
0
China
Dubai
Australia
Malaysia
Indonesia
VPT


Vessel Related
Charges
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
China
Dubai
Australia
Malaysia
Indonesia
VPT

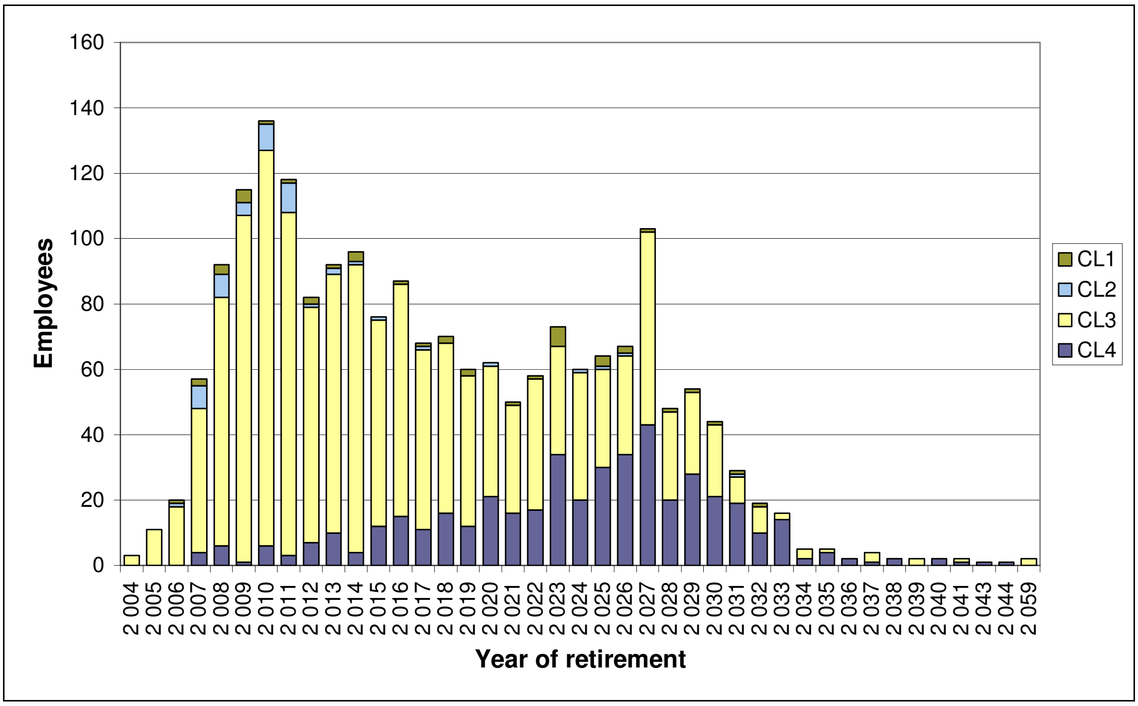
ANNEX 9.4 Department wise and class wise retirement profile and annual salaries

Administrative department - retirement profile

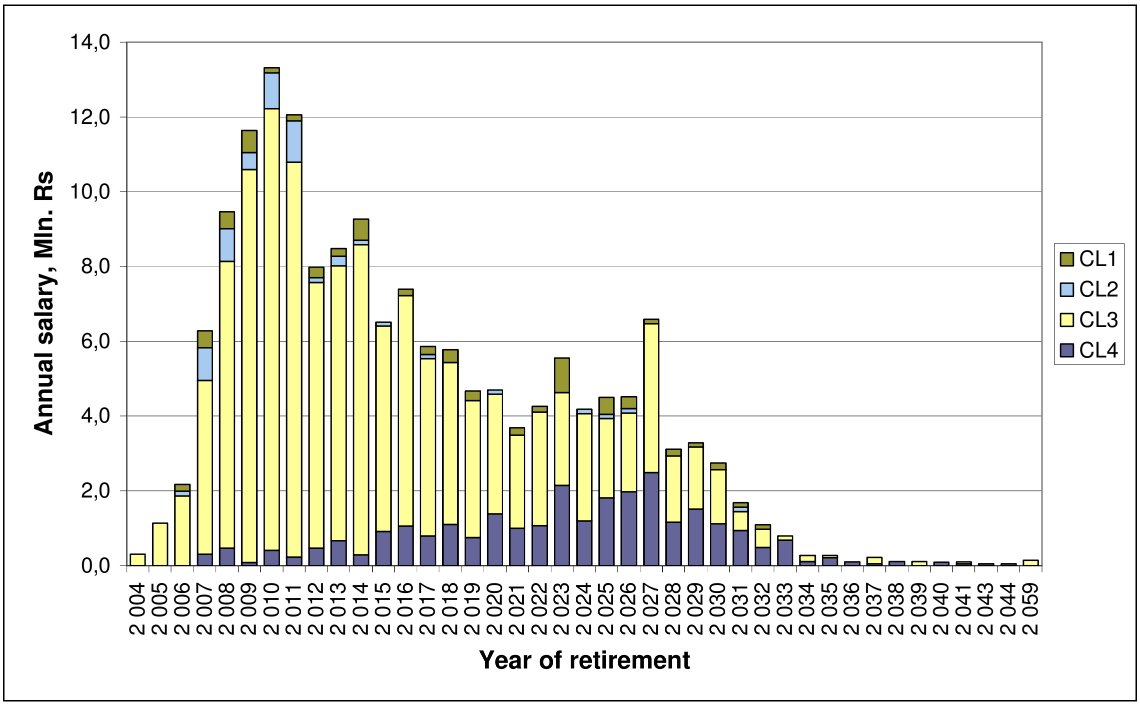


Administrative department – annual salaries

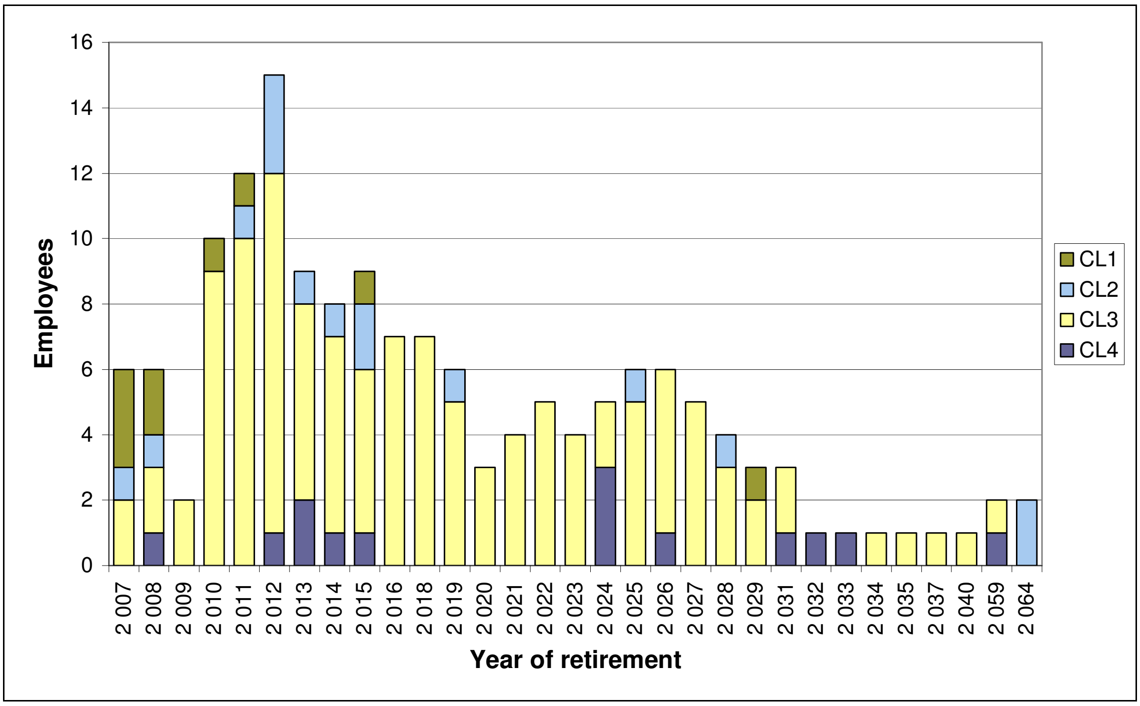
Engineering Services Department - retirement profile



Engineering Services Department – annual salaries

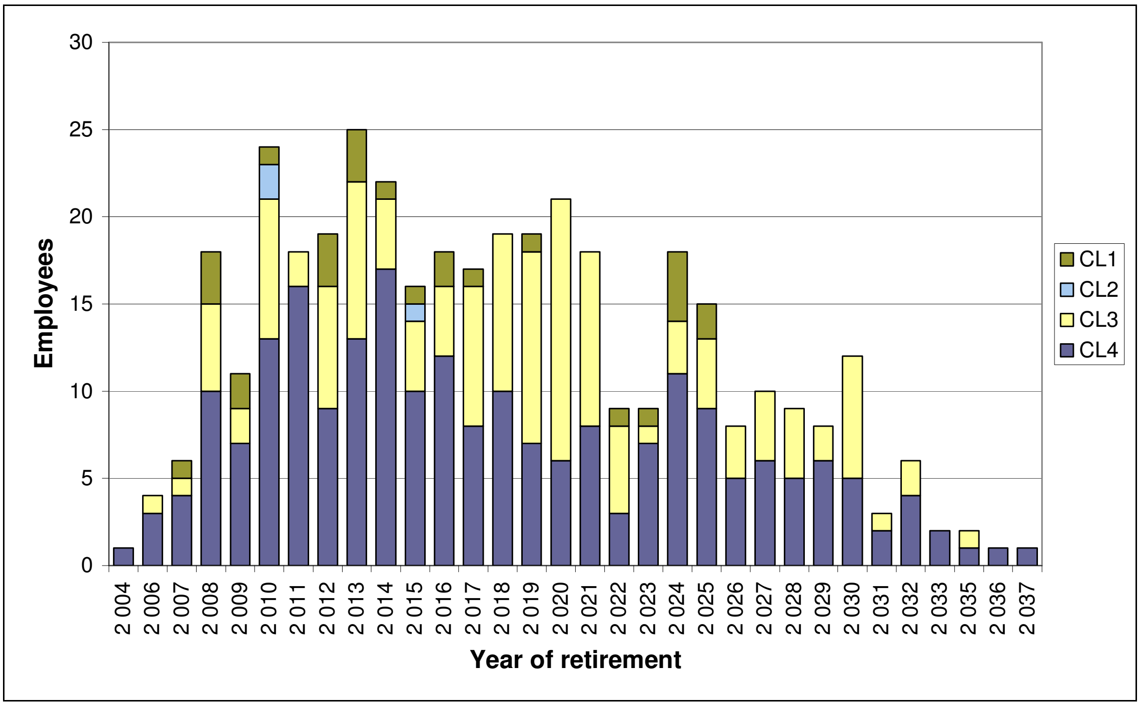


Finance Management department - retirement profile

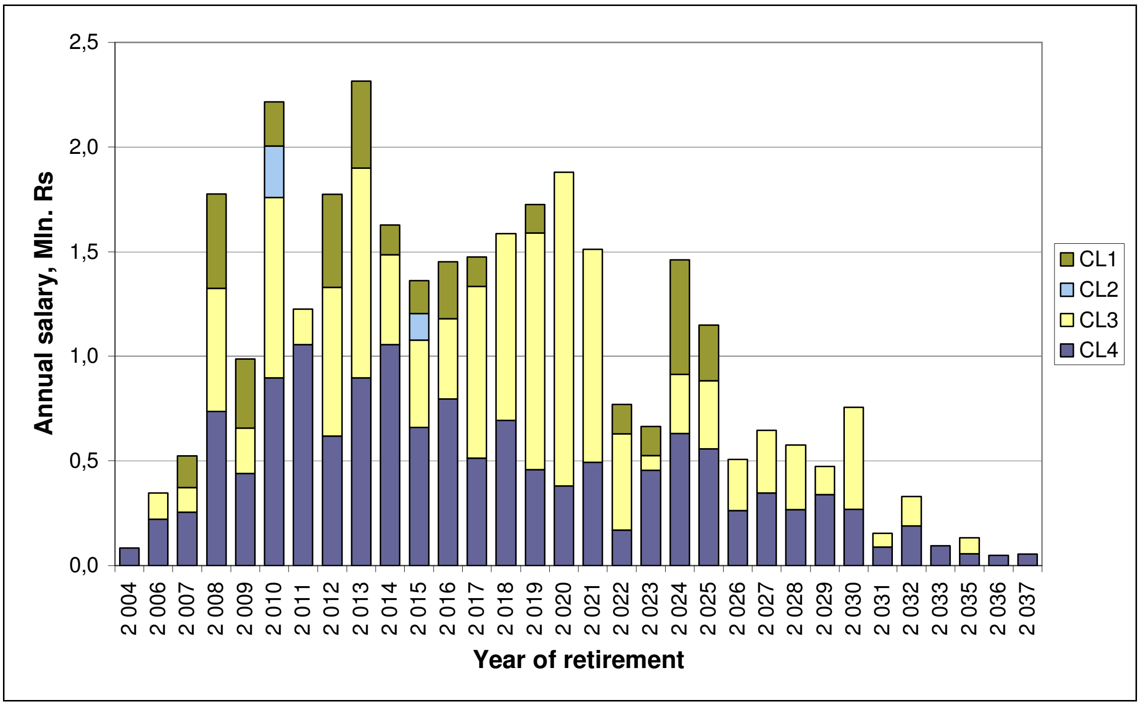


Finance Management department – annual salaries

Health Care Services - retirement profile

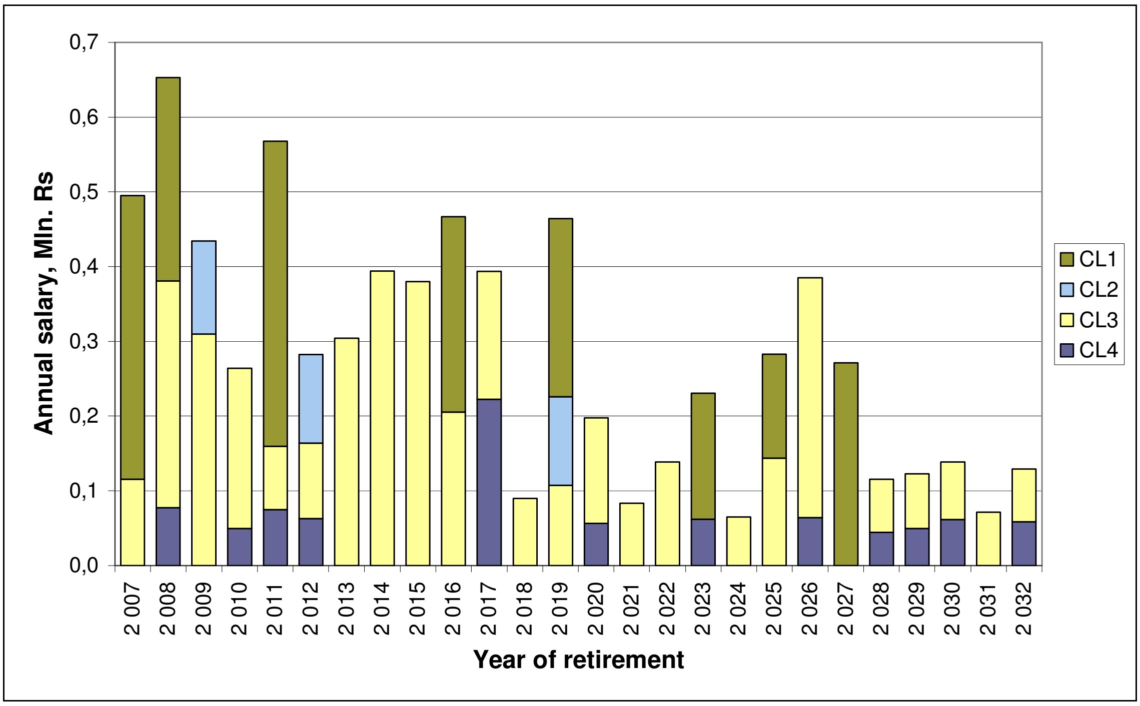


Health Care Services – annual salaries

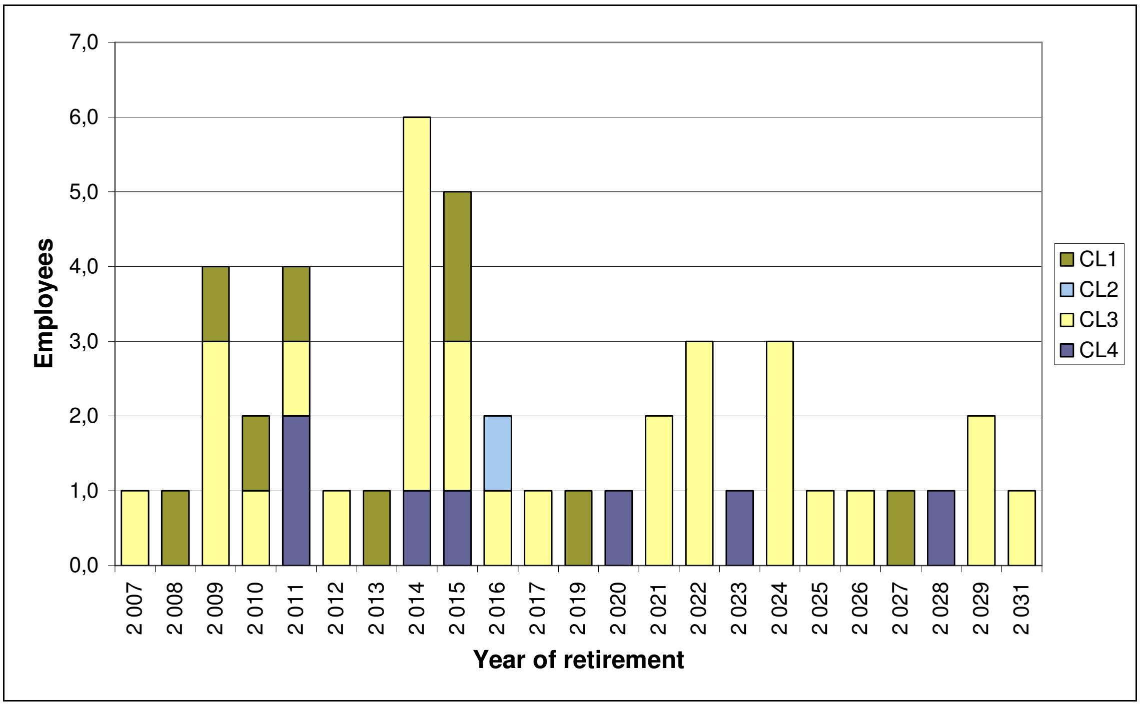


Human resource management - retirement profile

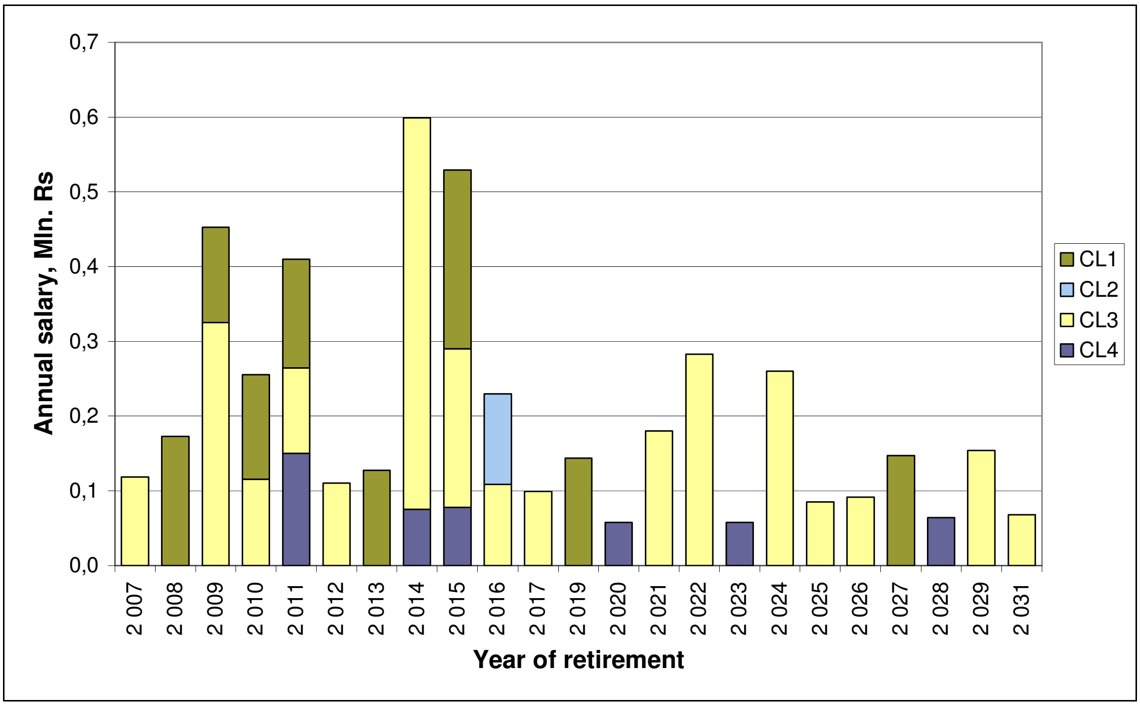
Human resource management – annual salaries



Knowledge management technology - retirement profile

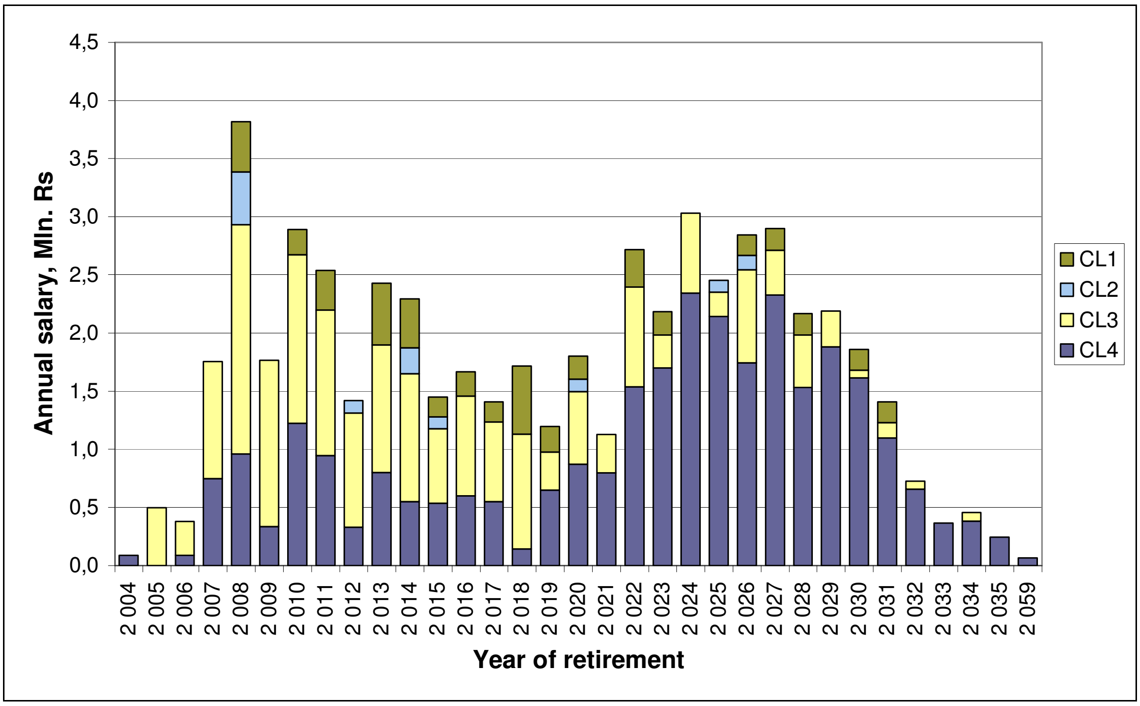


Knowledge management technology – annual salaries

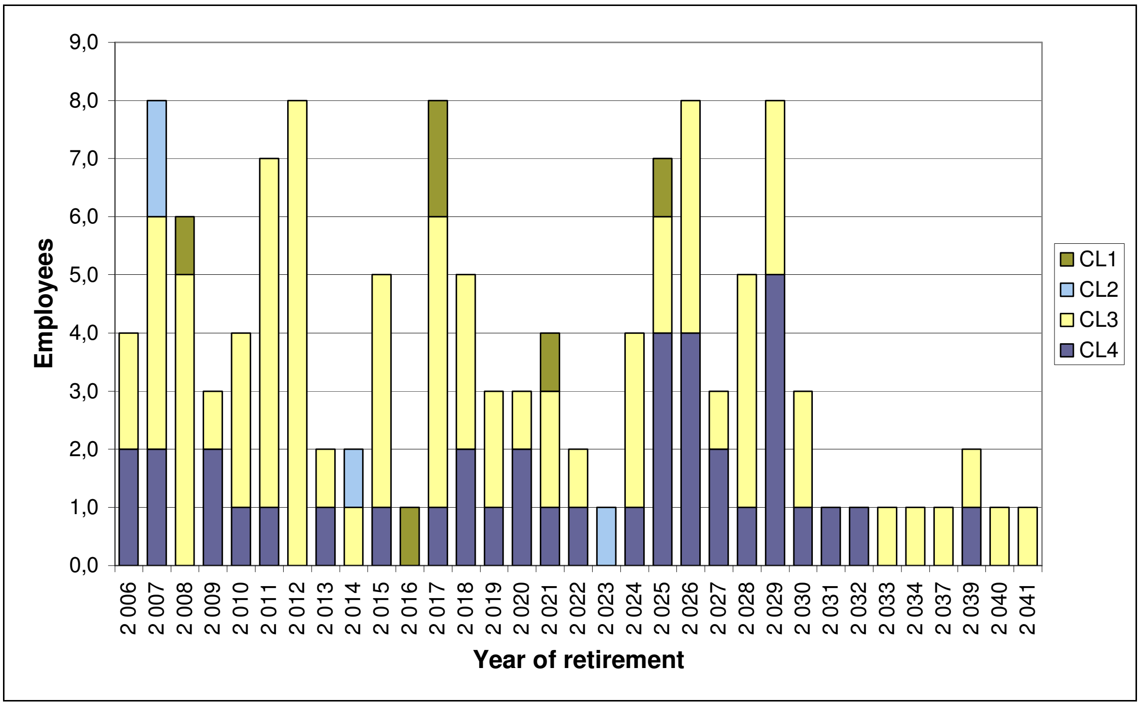


Marine operations management – retirement profile

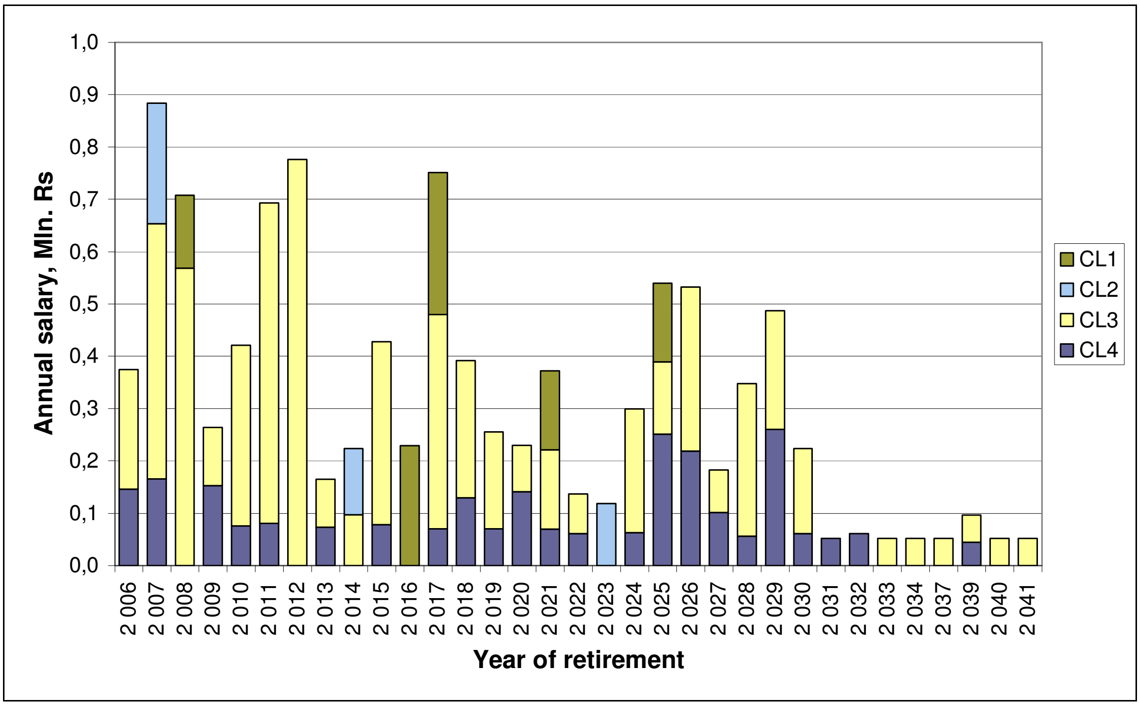
Marine operations management – annual salaries



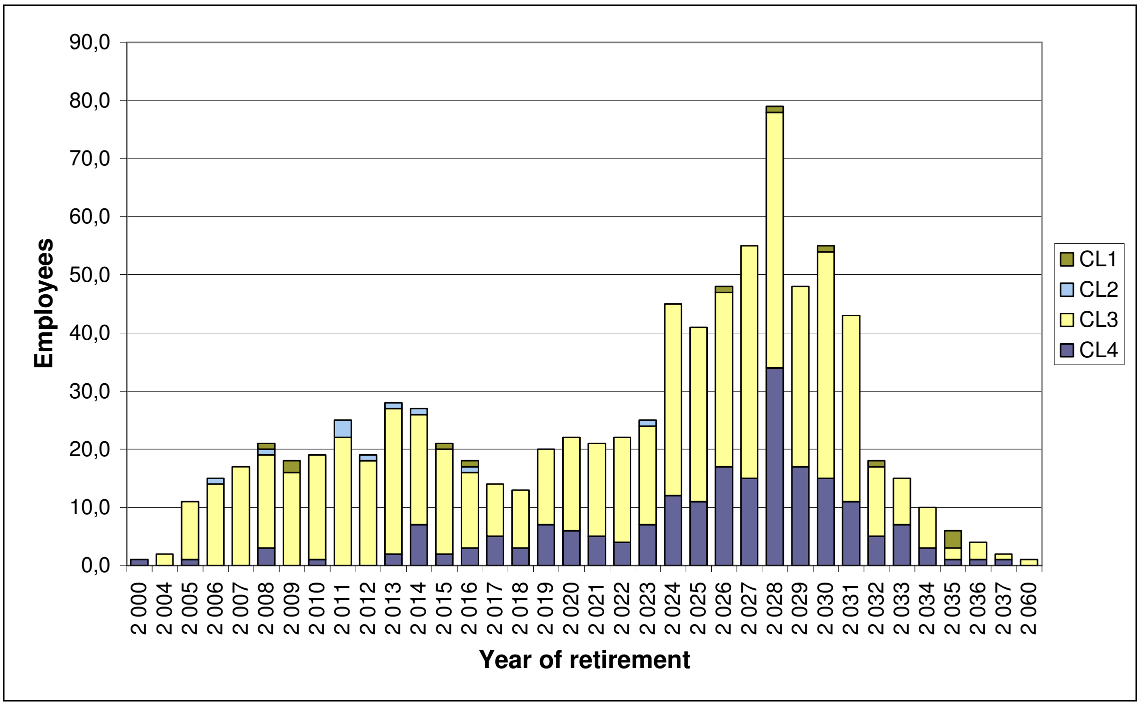
Materials management services – retirement profile



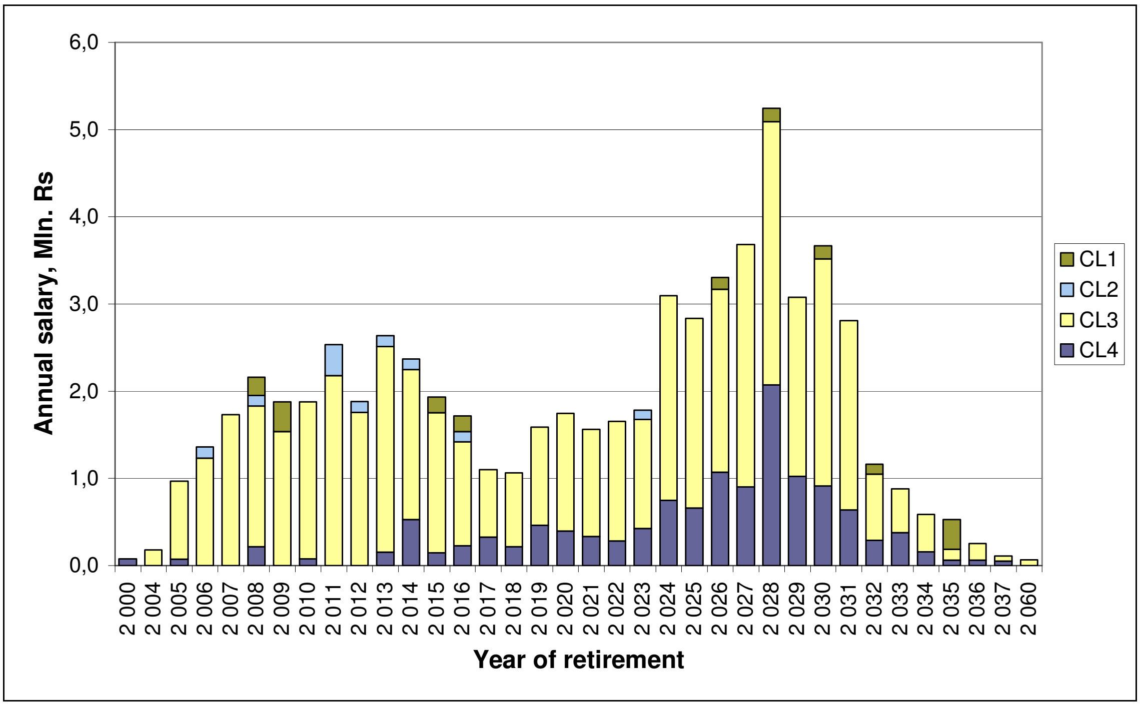
Materials management services – annual salaries



Port operations management – retirement profile

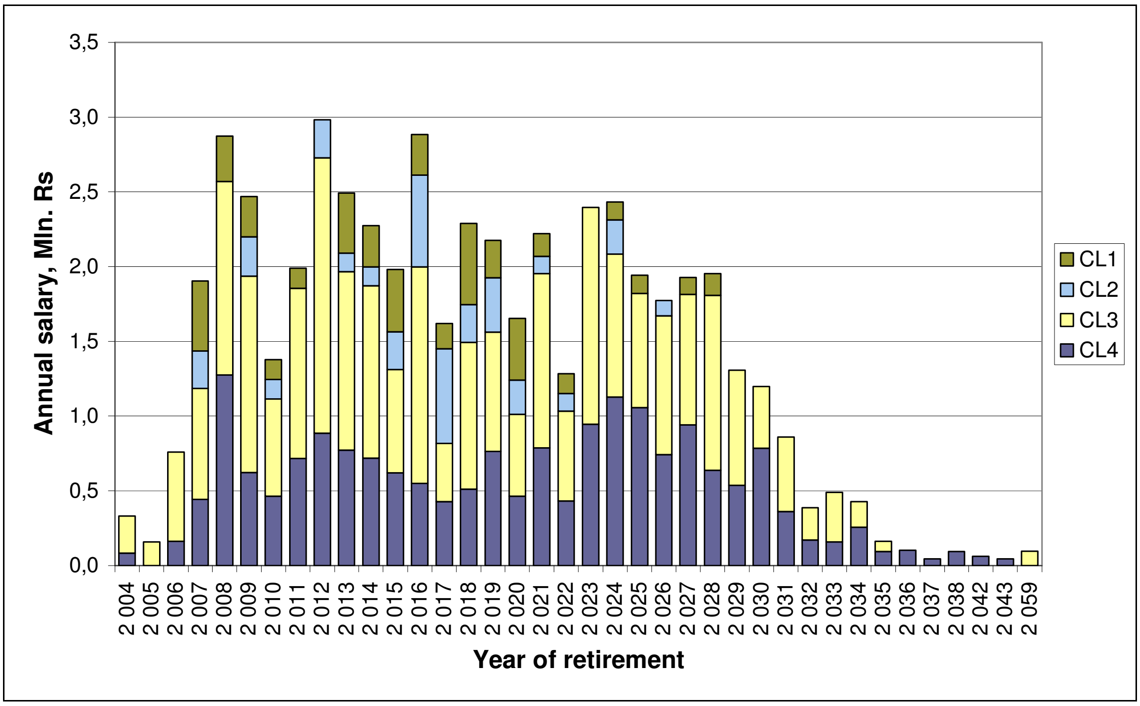


Port operations management – annual salaries



Port planning & management – retirement profile

Port planning & management – annual salaries



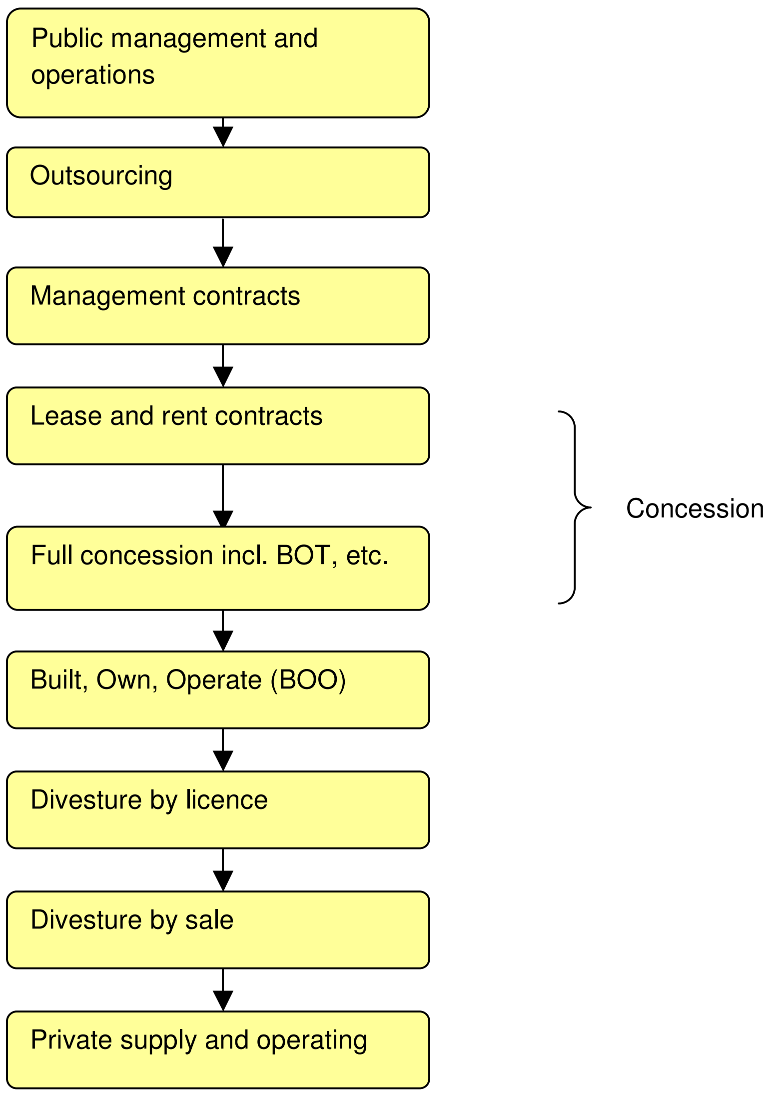
ANNEX TO CHAPTER 10

ANNEX 10.1 Possible contractual forms

General

The GoI is moving in the direction of a Landlord port model, engaging private operators to manage the operations. Within the framework of this policy, there is a variety of legal options to engage private operators to carry out terminal management activities. In general, the following options as presented are available.

Port reform options



Source: World Bank Port Reform Toolkit, 2001

The figure shows the progression from full public involvement in port management, development and operations onto full privatisation. Most of the above options are not suitable for the Indian situation. Continuation of the present Service Port situation is, in any case, not considered feasible for the Port of Aden. This leaves two main options for analysis, namely: a management contract or a concession of whatever structure. In both cases the Government retains the ultimate ownership of the port land, sufficiently safeguarding long-term public interests. When concluding a concession it is also (partly) relieved of operational risks and financial burdens.

Risk identification

Generally, the different types of risks that BOT concessions are exposed to can be divided into two broad categories:

- General (or country) risks, which are associated with the political, economic and legal environment of host country and over which the project sponsors generally have little or no control. The project sponsors assess these before engaging into the concession agreement.
- Specific project risks, which are controllable to some extent by the project sponsors. BOT concessions put these risks with the project sponsors.

The general or country risks may be further divided into three main categories:

- Political risks: political support risks, taxation risks, expropriation/nationalisation risks, forced buy-out risks, cancellation of concession, import/export restrictions and failure to obtain or renew approvals
- Country commercial risks: currency convertibility risks, foreign exchange risks, devaluation or inflation risks, interest rate risks
- Country legal risks: changes in laws and regulations, law enforcement risks, delays in calculating compensation.

The specific project risks may also be divided into three further categories:

- Development risks: bidding risks, planning delays risks, approval risks.
- Construction/completion risks: delay risks, cost overrun risks, re-performance risks, completion risks, force majeure risks, loss or damage to work, liability risk.
- Operating risks: associated infrastructure risks, technical risks, demand/supply risks (volume and price), cost escalation risks, management risks, force majeure risk, loss or damage of project facilities, liability risk.

MANAGEMENT CONTRACT

A management contract with an international operator might be useful in the event that it is difficult to engage a local operator. It is a temporary solution for a management problem.

Consultants do not advise a management contract as a long-term solution. There are two reasons not to favour this solution:

(i) the client (ports authority) retains the major risks for present and future investments but can exercise limited influence on terminal operations. This situation is in the long term not sustainable, especially in the event of port expansion and costly equipment requirements.
(ii) the port aims at attracting transhipment cargoes. Therefore the terminal operator should be part of an international network of shipping lines and global stevedores. The optimum situation is an operator, which also holds shares in the terminal, or is engaged by a major private shareholder.

CONCESSION CONTRACT
General
Landlord ports derive a substantial part of their income from (long) lease, rent of port land or concession fees. Concession fees usually relate both to the use of port land and (container) throughput. Generally, there are two forms of concessions:

- Lease contracts. An operator gets a long-term lease on the port land, operates a terminal and is usually responsible for the provision of superstructure and equipment;
- (Full) concession contracts where the operator covers investment costs of operational infrastructure and equipment and carries commercial risks. Such contracts are often combined with specific financing and construction schemes such as Build, Operate & Transfer (BOT).

In this report, *both lease and full concession agreements* are considered concessions. They share the same characteristics:

- Government or (public) port authority grants specific rights to a private company;
- The concession has a defined term (10-50 years);
- A concession is geographically delimited;
- The agreement directly or implicitly allocates financial and operational risks.

Three types of leases
In general, there are three basic types of leases: flat rate, mini-max and shared revenue. In these systems only land or warehouse facilities are taken into account for concessions or lease. The Ports Authority keeps, as a separate item, all revenue from vessels on berthing fees, etc. as it was responsible for quay construction.

A *flat rate type of lease* has the following characteristics. The leaser gives to the user (lessee) the right to use a fixed asset for a specific period of time in exchange for a fixed amount of money. In respect to land, this can be a sum per year per square meter, with a distinction between unpaved and paved and with or without shed/warehouse. The main advantage of this system is that both parties know costs and benefits in advance. The flat rate also provides to the lessee the greatest incentive to generate as much business as possible for the terminal. The main characteristics of this type of lease are:

- A specific sum of money is to be paid per square meter of port area for a specific period of time;
- The lease should represent a 'fair return' on the value of the property;
- Inflation adjustment on the lease amount is allowed.

The Ports Authority should be able to accurately anticipate the level of business of the lessee because, if not, the port may end up foregoing a large amount of money.

The flat rate lease is the best alternative if the port intends to *maximise throughput* and provide benefits to the local economy through increased employment.

In the case of a *Mini-Maxi rate* the owner (leaser) gives to the user (lessee) the right to use a fixed asset for a specific period of time in exchange for a *variable* amount of money. There is a minimum and a maximum amount for the lease depending on activities performed on the fixed asset. The characteristics of this type of lease are as follows:

- The compensation to be paid by the lessee to the leaser (Port Authority) for the use of the equipment and the land is established on a scale, which is determined by minimum and maximum throughputs;
- The scale varies with the actual volume and not on *the forecast volume* of the throughput;
- The minimum rate is applied to the minimum (lowest part) of the terminal throughput;
- From this minimum a sliding scale is applied until a certain maximum throughput is reached;
- After this, no further increase of compensation is applied.

There is thus a pre-established bottom and ceiling to be paid (the lessee will pay more or less depending on the amount of tonnage handled. The major characteristic of this type of lease is that the Port Authority shares some benefits of increased throughput, but on the other hand limits its own investment risks.

In the case of a *shared revenue lease* the owner (lessor) gives to the user (lessee) the right to use a fixed asset for a fixed period of time in exchange for a variable amount of money. The distinction with the mini-max rate is that there will always be a minimum rate to be paid regardless of the activity, but there is no maximum limit agreed. Main characteristics of this lease system are:

- There is always a minimum level of compensation;
- There is no established maximum level;
- The boundary condition for maximum compensation is the terminal capacity;
- Minimum compensation may not fully cover the interest and amortization required by the lessor (Port Authority) for the lease area.

This type is a form of partnership between the port and the lessee. The port should determine the minimum rental amount to be received. The lessee will pay to the Ports Authority until the reasonable total annual rental sum has been covered. Afterwards the lessee and the port will share the benefits on any additional activity. This is the only system whereby *Port Authorities* can maximize profits, employment levels and throughput without any subsidisation of the lessee.

The three types of lease discussed above can be applied for so-called *multi-user* as well as for *single-user, or dedicated* terminals or berths.

The term of any lease contract is mainly depending on the investments required by the operator to make the terminal fully functional. In the case of investments only in superstructure and equipment the contract term is often limited to a period of ten to fifteen years with an option to continue. In some world ports such as Rotterdam the rent could be re-negotiated after periods of five years.

In case of a traditional lease contract, the port land is usually transferred back to the lessor in its original state, *i.e.* devoid of any superstructure and equipment.

	Year	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Throughput																					
non-Ore Berths, non liquids	Mt	23,1	23,4	25,2	27,7	30,4	32,5	36,7	38,2	41,1	43,3	44,6	46,2	47,9	49,2	50,0	50,9	51,7	52,5	53,4	54,3
Liquids	Mt	14,6	14,2	15,2	19,2	21,3	23,8	27,6	27,8	28,0	28,2	28,4	28,5	28,6	28,7	28,8	28,9	29,0	29,1	29,2	29,3
Ore Berths	Mt	15,0	15,0	16,5	17,5	17,5	17,5	20,5	20,5	20,5	20,5	20,5	20,5	20,5	20,5	20,5	20,5	20,5	20,5	20,5	20,5
Containers	Mt	0,8	1,3	1,9	2,4	2,9	3,5	4,0	4,4	4,8	5,3	5,9	6,4	7,1	7,8	8,0	8,0	8,0	8,0	8,0	8,0
Vessel calls	#																				
Total throughput		53,5	53,9	58,8	66,8	72,2	77,3	88,9	90,9	94,4	97,4	99,4	101,7	104,1	106,2	107,3	108,3	109,2	110,2	111,1	112,1
Revenue per ton		96	96	95	89	86	83	84	83	82	80	79	79	78	77	77	76	76	76	76	75
Revenues																					
Cargo Handling non-Ore Berths, non-liquids		504	510	418	172	119	131	141	145	155	161	167	173	179	185	192	198	205	211	218	225
Cargo Handling Liquids		536	553	608	666	647	713	816	821	827	833	838	844	849	855	861	866	872	877	883	888
Cargo Handling Ore Berths		1 425	1 425	1 568	1 663	1 663	1 663	1 948	1 948	1 948	1 948	1 948	1 948	1 948	1 948	1 948	1 948	1 948	1 948	1 948	1 948
Other Cargo related income																					
Port & Dock dues		407	418	432	456	504	543	622	637	666	673	689	707	724	741	750	758	766	773	781	789
Pilotage/towage		1 148	1 128	1 204	1 287	1 312	1 342	1 556	1 573	1 602	1 627	1 643	1 663	1 682	1 700	1 708	1 716	1 724	1 731	1 739	1 747
Other Marine related income		54	54	57	61	64	66	76	77	79	80	82	83	84	85	86	87	87	88	88	89
Railway income		830	830	913	969	969	969	1 135	1 135	1 135	1 135	1 135	1 135	1 135	1 135	1 135	1 135	1 135	1 135	1 135	1 135
Total Revenue		**4 904**	**4 917**	**5 202**	**5 273**	**5 277**	**5 425**	**6 293**	**6 337**	**6 411**	**6 457**	**6 501**	**6 552**	**6 601**	**6 649**	**6 679**	**6 708**	**6 735**	**6 762**	**6 792**	**6 821**
Royalties and land lease																					
Estate income		222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Royalties on non-Ore Berths, non Liquids		0	0	134	445	570	608	707	735	798	847	872	905	938	963	976	990	1 003	1 017	1 030	1 044
Royalties on Liquids		0	0	0	0	107	127	154	161	167	174	181	181	181	181	181	181	181	181	181	181
Royalties on Ore Berths		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Royalties on Containers		7	14	23	34	47	64	83	92	101	111	122	134	148	162	167	167	167	167	167	167
Total royalties		**229**	**236**	**378**	**701**	**946**	**1 022**	**1 166**	**1 209**	**1 288**	**1 354**	**1 397**	**1 442**	**1 488**	**1 528**	**1 545**	**1 559**	**1 573**	**1 586**	**1 600**	**1 614**
Total revenue		**5 133**	**5 154**	**5 580**	**5 974**	**6 223**	**6 447**	**7 460**	**7 546**	**7 699**	**7 811**	**7 898**	**7 994**	**8 090**	**8 177**	**8 224**	**8 267**	**8 308**	**8 349**	**8 392**	**8 435**
Operating Costs																					

BUSINESS PLAN VPT

TATA CONSULTANCY SERVICES

			Year	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
				2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Employment	Headcount			5093	4886	4745	4616	4459	4308	4179	4044	3908	3796	3676	3580	3479	3381	3281	3189	3091	2980	2842	2714
Total Labour cost				**1 742**	**2 089**	**2 028**	**1 973**	**1 906**	**1 842**	**1 786**	**1 729**	**1 671**	**1 623**	**1 571**	**1 530**	**1 487**	**1 445**	**1 402**	**1 363**	**1 321**	**1 274**	**1 215**	**1 160**
Repair & Maintenance				958	974	1 068	1 163	951	1 063	1 184	1 179	1 203	1 216	1 219	1 227	1 235	1 241	1 235	1 229	1 225	1 222	1 222	1 128
Fuel & lubricants				141	141	155	164	164	164	193	193	193	193	193	193	193	193	193	193	193	193	193	193
Total repair, maint, fuel and lubricants				**1 099**	**1 115**	**1 223**	**1 327**	**1 116**	**1 227**	**1 377**	**1 372**	**1 395**	**1 409**	**1 412**	**1 420**	**1 427**	**1 434**	**1 427**	**1 421**	**1 417**	**1 415**	**1 414**	**1 321**
Total Other operating costs				**72**	**72**	**79**	**84**	**84**	**84**	**99**	**99**	**99**	**99**	**99**	**99**	**99**	**99**	**99**	**99**	**99**	**99**	**99**	**99**
Total operating costs				**2 912**	**3 276**	**3 331**	**3 385**	**3 106**	**3 153**	**3 262**	**3 199**	**3 164**	**3 130**	**3 082**	**3 049**	**3 013**	**2 978**	**2 928**	**2 883**	**2 837**	**2 787**	**2 728**	**2 579**
Other overhead costs				**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**
Total non operating costs				**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**	**231**
Total costs				**3 143**	**3 507**	**3 561**	**3 616**	**3 337**	**3 384**	**3 493**	**3 430**	**3 395**	**3 361**	**3 312**	**3 279**	**3 244**	**3 208**	**3 159**	**3 114**	**3 068**	**3 018**	**2 959**	**2 810**
		Cost per ton		58,7	65,1	60,6	54,1	46,2	43,8	39,3	37,7	36,0	34,5	33,3	32,2	31,2	30,2	29,4	28,8	28,1	27,4	26,6	25,1
EBITDA				**1 990**	**1 647**	**2 018**	**2 358**	**2 886**	**3 063**	**3 967**	**4 116**	**4 304**	**4 450**	**4 586**	**4 714**	**4 846**	**4 969**	**5 066**	**5 153**	**5 240**	**5 330**	**5 433**	**5 624**
Depreciation				336	336	379	467	493	577	668	615	615	616	616	616	505	446	446	417	417	417	417	417
EBIT				**1 654**	**1 310**	**1 639**	**1 892**	**2 393**	**2 486**	**3 299**	**3 501**	**3 689**	**3 835**	**3 970**	**4 099**	**4 341**	**4 523**	**4 619**	**4 736**	**4 822**	**4 913**	**5 016**	**5 207**
Financial income				147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147
Interest				0	30	29	252	236	219	203	186	170	153	137	120	104	87	71	54	38	21	5	3
Interest on Investment reservation			4%	0	50	92	16	42	16	5	91	203	323	451	587	731	882	1 040	1 205	1 377	1 557	1 745	1 902
Provision Pension Fund		yes	3	650	683	717	753	791	831	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VRS					0																		
		Financial cost per ton		16	16	15	20	18	19	8	6	5	3	2	0	-3	-5	-6	-8	-10	-11	-13	-15
EBT				**1 151**	**794**	**1 133**	**1 051**	**1 556**	**1 599**	**3 249**	**3 553**	**3 870**	**4 152**	**4 432**	**4 714**	**5 116**	**5 465**	**5 736**	**6 035**	**6 309**	**6 597**	**6 903**	**7 253**
		Total pre-tax cost per ton		74	81	76	74	65	63	47	44	41	38	35	32	29	26	23	21	18	16	13	11
Tax	30%			345	238	340	315	467	480	975	1066	1161	1245	1330	1414	1535	1640	1721	1810	1893	1979	2071	2176
		Total pre-tax cost per ton																					
Net Income		tax rate		**806**	**556**	**793**	**735**	**1 089**	**1 119**	**2 274**	**2 487**	**2 709**	**2 906**	**3 103**	**3 300**	**3 581**	**3 826**	**4 015**	**4 224**	**4 417**	**4 618**	**4 832**	**5 077**
		Net income per ton after tax		15	10	13	11	15	14	26	27	29	30	31	32	34	36	37	39	40	42	43	45

BUSINESS PLAN VPT

			3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2
			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2
Assets																				
NBV Equipment			1 078	2 735	5 393	7 873	9 464	10 766	10 839	10 472	10 104	9 725	9 346	8 967	8 542	8 175	7 809	7 472	7 134	6
NBV Buildings, civil works			6 412	6 123	5 833	5 544	5 255	4 965	4 676	4 440	4 203	3 967	3 731	3 494	3 414	3 334	3 254	3 174	3 094	3
Total PPE			7 490	8 858	11 226	13 417	14 718	15 731	15 515	14 912	14 308	13 692	13 077	12 461	11 956	11 509	11 063	10 646	10 228	9
Investments			4 485	4 485	4 485	4 485	4 485	4 485	4 485	4 485	4 485	4 485	4 485	4 485	4 485	4 485	4 485	4 485	4 485	4
Investment reservation			1 240	2 291	411	1 047	389	136	2 276	5 063	8 068	11 281	14 685	18 284	22 053	25 998	30 128	34 434	38 928	43
Inventory	5%	of NBV Equipment	54	137	270	394	473	538	542	524	505	486	467	448	427	409	390	374	357	3
Accounts Receivable	30	days of revenues	403	404	428	433	434	446	517	521	527	531	534	539	543	547	549	551	554	5
Other current assets			2 743	2 743	2 743	2 743	2 743	2 743	2 743	2 743	2 743	2 743	2 743	2 743	2 743	2 743	2 743	2 743	2 743	2
Cash and liquid securities	2%	of assets	308	334	385	399	458	474	491	531	576	624	677	733	794	860	931	1 006	1 085	1
TOTAL ASSETS			**16 723**	**19 252**	**19 947**	**22 918**	**23 700**	**24 553**	**26 570**	**28 778**	**31 211**	**33 842**	**36 668**	**39 693**	**43 000**	**46 551**	**50 290**	**54 238**	**58 379**	**62**
Liabilities																				
Net Debt			159	2 059	1 959	4 193	3 926	3 659	3 393	3 126	2 859	2 593	2 326	2 059	1 793	1 526	1 259	993	726	4
Other non interest bearing liabilities			3 199	3 199	3 199	3 199	3 199	3 199	3 199	3 199	3 199	3 199	3 199	3 199	3 199	3 199	3 199	3 199	3 199	3
Salaries	1/12	of salaries	145	174	169	164	159	153	149	144	139	135	131	128	124	120	117	114	110	
Accounts payable	45	days of operating costs	388	432	439	446	411	417	431	423	419	414	408	404	400	396	389	384	378	3
TOTAL LIABILITIES			**3 891**	**5 865**	**5 767**	**8 002**	**7 695**	**7 429**	**7 171**	**6 892**	**6 616**	**6 341**	**6 064**	**5 790**	**5 516**	**5 241**	**4 965**	**4 689**	**4 413**	**4**
Equity			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reserves & Surpluses			12 026	12 026	12 026	12 026	12 026	12 026	12 026	12 026	12 026	12 026	12 026	12 026	12 026	12 026	12 026	12 026	12 026	12
Additional paid in capital																				
Retained earnings			806	1 362	2 155	2 890	3 979	5 098	7 373	9 860	12 569	15 475	18 578	21 877	25 458	29 284	33 299	37 523	41 940	46
TOTAL EQUITY			**12 832**	**13 388**	**14 180**	**14 916**	**16 005**	**17 124**	**19 399**	**21 886**	**24 595**	**27 501**	**30 604**	**33 903**	**37 484**	**41 310**	**45 325**	**49 549**	**53 966**	**58**
TOTAL LIABIITIES + EQUITY			**16 723**	**19 253**	**19 947**	**22 918**	**23 700**	**24 553**	**26 570**	**28 778**	**31 211**	**33 842**	**36 668**	**39 693**	**43 000**	**46 551**	**50 290**	**54 239**	**58 379**	**62**