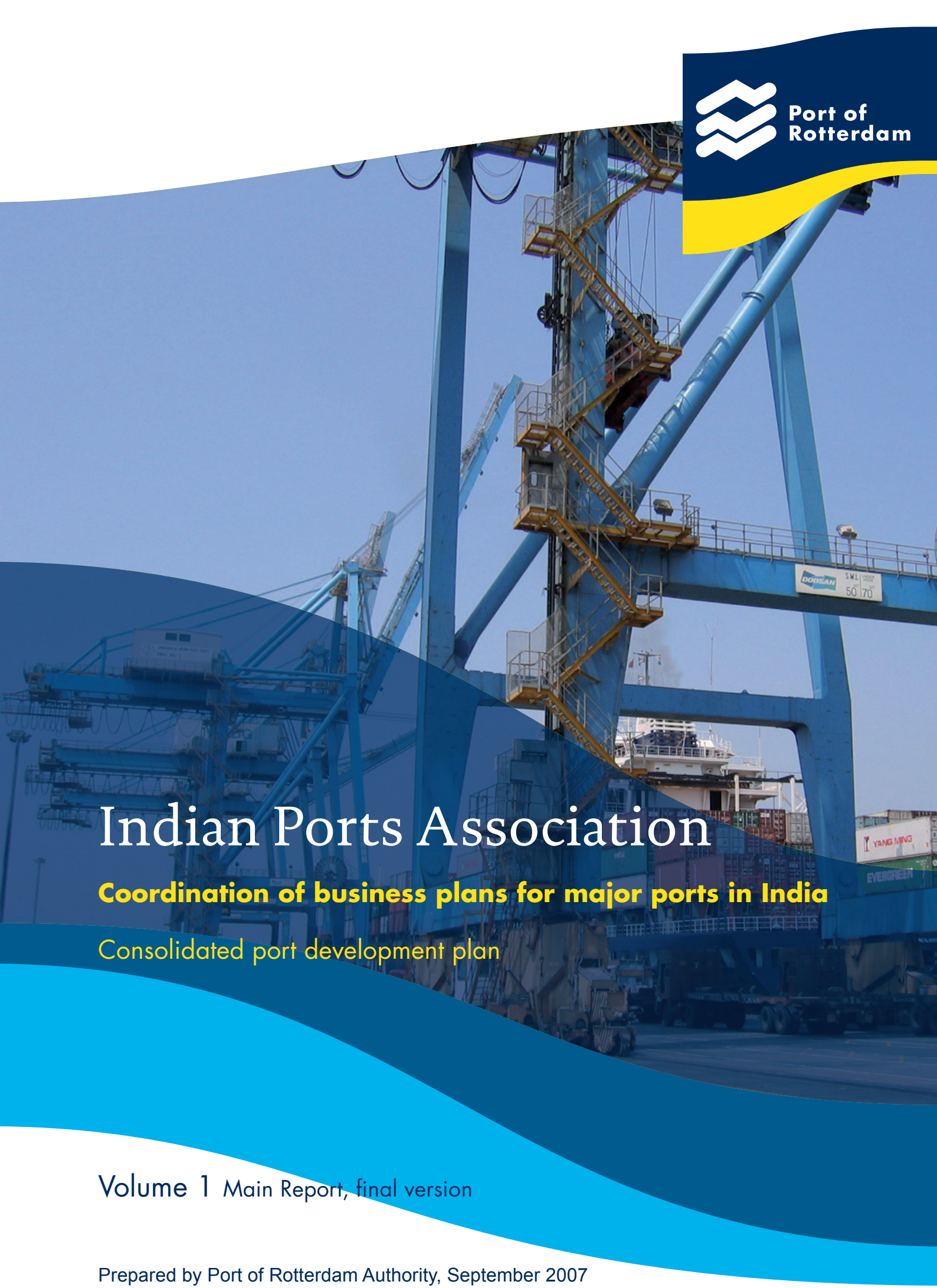

Indian Ports Association

Coordination of business plans for major ports in India

Consolidated port development plan

Volume 1 Main Report, final version

Prepared by Port of Rotterdam Authority, September 2007

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Executive summary

Observations on the project

The Ministry of Shipping, Road Transport and Highways (MOSRTH), which Ministry is responsible for overseeing the 12 Major Ports in the country, has mandated that each of the 12 Major Ports develop a Business Plan. Subsequently each of the 12 Major Ports engaged consortia of international and national Consultants to:

1. Prepare a Business Plan for the port that can be implemented without any government financial support;
2. Install a process for monitoring and reporting progress in achieving results;
3. Provide the capability to update the plan annually to reflect changing circumstances.

The Indian Ports Association awarded the Port of Rotterdam in March 2006 the contract to act as Advisor to review the process and results of the preparation of the Business Plans of the 12 Major Ports. The Indian Ports Association acted as the contract party and monitored the work of the Advisor.

The overall goal of the development of Business Plans for the 12 Major Ports was:

"To transform Indian Ports into world class facilities suited to the requirements of the future economy of India"

This major exercise was conducted in a year's time. Where all Consultants submitted a kind of 'helicopter view' for each port for the years to come, the Advisor herewith submits his 'satellite view' in this report.

Obviously the quality of the Business Plans varied to some extent. Most reports were informative and contained many analyses. Some reports were of high quality. This report is kept as condensed as possible. For more information reference is made to Volume II, where the Business Plans are summarised, and to the Business Plans themselves.

Vision and strategy

Vision, mission and strategy were defined for all ports, but in earlier stages of the project these were not always translated into port development plans and projects. All missions and visions appeared to be ambitious and most of the ports want to become the most important or best port in their regions. The port user however, is not mentioned very often in these missions and visions.

Strategies were developed to achieve the port missions. They can be characterised as follows:

- Many projects were proposed in each port (many NMDP);
- Few innovative ideas were launched;
- Many organisational improvements were proposed;
- Few ports suggested to change the institutional setting;
- The strategies focused on the short and medium term and masterplanning beyond 2014 was mostly lacking.

Competition

The competitive situation within the Indian port sector can be characterised as follows:

- The Major Ports have a market share of 75% and form a kind of cartel;
- There is hardly competition between the Major Ports;
- Intermodal competition is virtually lacking due to an insufficient and inefficient supply of hinterland infrastructure and rolling stock;
- Within-port competition is almost absent, JNPT is a welcome exception;
- International port competition for transhipment is impossible due to the high port costs in India and present regulations (cabotage);
- There is increasing competition from the private ports and minor ports.

Regarding port competition the following remarks and recommendations can be made:

- Encouragement of competition is strongly related to port reform measures, which involves a long process;
- Quality of services and decrease of costs for the port users should be the primary goal;
- Sufficient port capacity should be created in time;
- Efficiency increase is needed, which can easily be achieved when creating a competitive environment;
- Large scale projects such as the development of large container terminals, should be integrated with hinterland connectivity projects;
- Private ports will gain market share, at least on the short term;
- Too often Port Trusts are of the opinion that the port who will be first in developing container terminals, will automatically get the cargo. It should be realised that the sustainability of a competitive advantage only lasts for the time needed by another port to offer the same or better facilities and services.

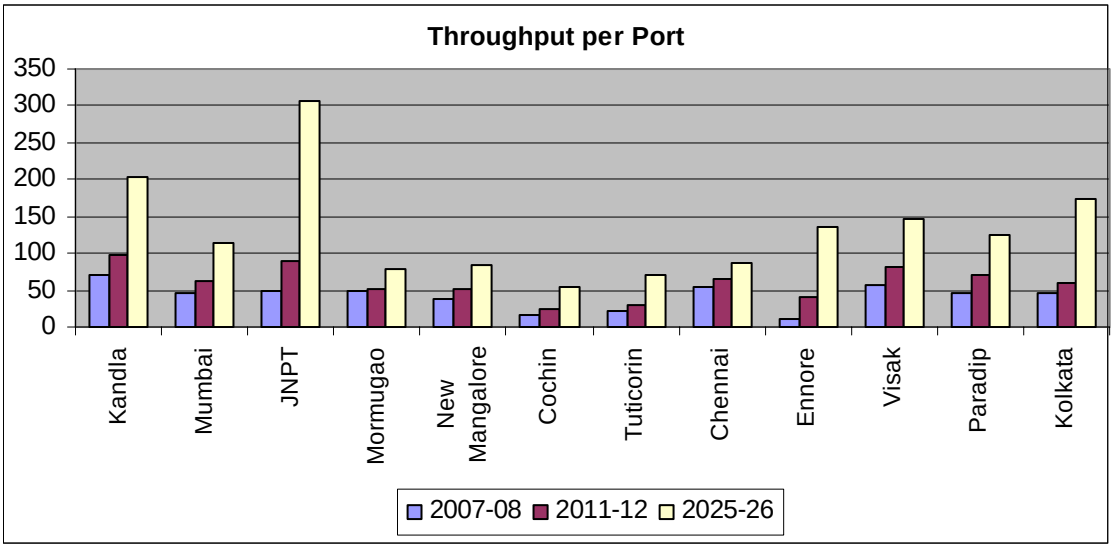
A general SWOT for the Major Ports was prepared by the Advisor and is presented below:

Strengths	Weaknesses
▪ High growth ▪ High market share ▪ Financial means available ▪ Most ports located at strategic locations	▪ Old infrastructure ▪ Limited water depth ▪ Old and inefficient cargo handling systems ▪ Poor hinterland connections ▪ Rigid institutional framework ▪ High tariffs ▪ Poor quality of services / business attitude ▪ Overstaffing ▪ Lack of capacity ▪ Lack of extension possibilities
Opportunities	**Threats**
▪ Introduce competition ▪ Huge Indian market, and landlocked countries in the North ▪ Improve organisation: training, IT, downsizing ▪ Port reform – more autonomy ▪ PPP other than BOT ▪ Invest in infrastructure, lower costs for port users ▪ Invest in total transport chain	▪ Private ports ▪ Minor ports ▪ Bureaucracy ▪ Time

SWOT table for the 12 Major Ports

Cargo Forecast

The cargo forecasts were generally of good quality. Most Consultants based the forecast on an analysis by commodity of historic trends; international, national and local developments; and competitive position. Most Consultants took the existing cargo mix as a basis for future forecasts; some also considered development of new cargo types. Iron ore and containers are the most competitive markets and the forecasts for these commodities were subject to most discussions.
The consolidated cargo forecast made by all Consultants is shown in the figure and table below:



	2007-08	2011-12	2025-26
POL	160,66	216,51	335,95
Iron Ore	95,64	108,97	139,52
Coal	74,49	126,68	189,61
Containers	83,88	161,38	679,97
Fertilisers	15,34	19,76	37,20
Other Cargo	80,44	106,11	212,82
Total	**510,47**	**739,41**	**1595,07**

Consolidated cargo forecast in M Tons

As can be seen from this figure the most Eastern and Western ports show the highest throughputs thanks to their vicinity to the large hinterland in the North. The Southern ports have a smaller hinterland but they are located close to the main international shipping routes, which could be an opportunity for the future.

Compared to the NMDP forecast prepared earlier, the Consultants predicted a port throughput which on average was 18% higher.

With respect to the container market the following observations can be made:

- Capacity for container handling at the Major Ports is limited. The largest one: JNPT, is predicted to reach capacity already by the year 2014;
- The upcoming private ports may solve the capacity problem, although it should be mentioned that not one of them is capable to handle several millions of TEU's in the near future. Nevertheless it may be expected that they will be the fastest within the country to create capacity. A choice could be made: should this be left to the private sector or:
- Should the Government create new major (container) ports on the East and West Coast?
- Make use of economy of scale, India is a suitable country for it;
- In the South Ennore seems to be in the best position for relatively easy container terminal development;
- On the East coast: Can the new West Bengal port become a new container hub?

- On the West coast it should be investigated whether new container port development needs to take place in Gujarat or Maharashtra.

Iron ore is another important commodity, for which the following observations can be made:

- Iron ore is the most important commodity in the port of Mormugao. Also in New Mangalore, Visak and Paradip it plays an important role;
- There is a shift towards the idea of using the iron ore national reserves for the development of India. The Government policy on exports of iron ore will determine the throughput volumes in the ports;
- Ennore offers opportunities for large scale iron ore facilities.

Port facilities

A land use plan was developed in most ports. However, a clear vision on port planning and phased development is lacking for some ports.

- High BOF (berth occupancy factor) is accepted, sometimes it is the aim to maximise the BOF where in fact a lowering to 60-70% should be strived for. This means that congestion is accepted at the expense of port users (and eventually Indian producers/consumers);
- Many ports are at or close to capacity and due to the constraints in available land, there are few possibilities to expand;
- Generally speaking the productivity on the berths is on the low side, a capacity increase can be achieved through mechanisation of cargo handling and other efficiency improvement measures. Ports also used to be 'berth-minded': constructing new berths before the capacity of the existing ones was increased. Fortunately there is presently a greater consciousness regarding increasing capacity of existing facilities;
- The move to a door-to-door concept of containers is not considered;
- Short term projects are worked out well;
- Masterplans are considered to a limited extent. A land use plan was developed in most ports. However, a clear vision on port planning and phased development is lacking for some ports. Development of a detailed strategic port master plan – beyond the scope of this project – was recommended for a few ports only.

Port planning

Some specific remarks can be made with respect to the characteristics and development possibilities in Major Ports:

- Kandla: mid to long term development outside creek is an opportunity;
- JNPT: mid to long term development is missing for this Indian main container port;
- Cochin, Tuticorin, and possibly other ports: the backbone concept should be further investigated. This was one of the very few innovative ideas brought forward by the Consultants: the development of a railway connectivity for cargo that could be jointly operated by the private sector and Major Ports. The Southern Major Ports are closest to the main maritime shipping routes. This railway line would foresee in fast and reliable transport of (mainly) containers to and from the North;

- Ennore is a major opportunity to become a 3rd generation port on the East Coast. It is in fact the only port where sufficient space is available to develop the port into a large worldclass port with basins of sufficient width and terminals with sufficient back up area. The present danger however is that long term planning is not taken into account and that the construction of terminals on the short term might block future developments;
- Paradip and Visakhapatnam could possibly be alternative container ports for North India, again on the condition that an integrated hinterland transport system, which needs to be fast and reliable, is taken into account;
- For old port cities Mumbai, Kolkata, Chennai the remark can be made that little synergy with their original satellite ports JNPT, Haldia, and Ennore is sought for. It is recommended to look for this synergy;
- In this respect it is worthwhile mentioning that both Mumbai and Chennai are opting for major container port development. Absolute priority should be given to direct hinterland connections taking into account autonomous traffic growth in these metropoles;
- Plans for transferring outdated port areas in urban developments with waterfront and warehousing functions are mentioned. This is a logical development and in case port functions can be shifted to deeper water this should be encouraged;
- For the Port of Kolkata IWT opportunities have not been taken into account. This should be explored.

Hinterland connectivity

As in many other countries, probably the most important transport/logistics challenge facing India is its infrastructure. While considerable private sector investment is now being directed into the development, expansion and modernisation of Indian ports, the country's road, rail and inland waterway systems have suffered from years of neglect and under-investment.

The average cost of freight is relatively high and India's inadequate transport infrastructure is holding back economic growth.

The system of distribution containers and containerised cargoes is highly concentrated with most containers for Delhi and north India being routed through the Mumbai/JNPT port complex. This route is already one of the busiest domestic freight arteries in the country. With new container terminal developments in Gujarat and with decent rail connections to and from the ports of Mundra and Pipapav this situation is changing gradually.

The Consultants have presented many problems and projects related to hinterland connectivity, most of them related to the direct vicinity of the port concerned. Although the Port Trusts are obviously very well aware of the hinterland connectivity problem within and directly outside the port, it is the impression of the Advisor that relatively little effort is made to promote and lobby for an integrated transport system on a national scale. This is clearly a responsibility of the national Government. It is recommended that the Major Ports would take a more pro-active approach to safeguard the smooth flow of cargo to the hinterland.

Port organisation and institutional setting

The Consultants have all examined the situation with respect to the internal organisation of the Port Trusts and recommended many projects for improvements. Most projects related to:

- (the establishment of) the Human Resources Department;
- (the establishment of) the Marketing Department;
- The improvement of the Information Technology structure.

Unfortunately only few Consultants have looked at the larger picture, which is the relations with the Ministry, the division of responsibilities and tasks between the Ministry and the Port Trust, the necessary level of autonomy, and suggestions for a stronger involvement of the private sector in the Indian ports. The Advisor is of the opinion that a clear division of responsibilities and tasks, taking into account an optimal (not maximum) level of autonomy, will form the foundation for the future of the Major Ports in India.

The present needs are:

- There should be an incentive to more competition amongst the Major Ports;
- Delegation of powers and responsibilities;
- Autonomy in tariff setting and investing;
- Fast decision making process;
- Operational freedom;
- Professionalism.

There are five basic options for port reform. The following is recommended:

1. Improve port organisation. As Consultants have pointed out, there is ample room for improvement.

2. Liberalisation: is already the case in JNPT and has worked out well. However, it is not recommended for further activities. On the contrary, in case the port wants to pursue the landlord model, the public container terminal would then be transferred to the private sector.

3. Commercialisation: delegation of powers and responsibilities from Ministry to ports. This is the option where most benefits can be achieved. The shift to the landlord port management model is the major activity to be undertaken, whereby the Port Trust will contract out non-core business, port operations will be transferred to the private sector and whereby the Port Trust will invest in infrastructure instead of the BOT operator in order to decrease costs for port users. BOT's should be avoided when sufficient funds are available.

4. Corporatisation: is a possible step after commercialisation, although less important. Ennore is the only corporatised Major Port.

5. Privatisation aspects will take place when transferring to the landlord management model through the sale of superstructural assets. Another privatisation aspect could be the formation of joint-ventures with private sector operators in the total transport chain to the hinterland.

Financial issues

Apart from a few Major Ports, the financial position of the Major Ports is very good. The following observations can be made:

- Funds available for investments by ports:
  - Over Rs 20.000 Cr in 2014;
  - Huge borrowing capacity over Rs 40.000 Cr in 2014;
- Future pressure on tariffs due to competition: port tariffs are high due to the monopolistic situation of the ports. Tariffs will go down when competition is getting stronger;
- Pressure on revenue sharing in BOT contracts will take place due to competition.Revenue shares are high due to monopolistic situation of the ports. Revenue shares will go down when competition is getting stronger;
- Economic development in India can be stimulated by lower costs and efficiency improvements, a.o. by applying the landlord model;
- Substantial investments in connectivity are needed and have an enormous positive effect on the economic development of India. Ports can participate in these connectivity projects, f.i. in the backbone concept;
- TAMP-regulation is not stimulating efficiency;
- Ports can also participate in other (private) ports when there is limited room for own expansion;
- Especially city-ports can think about expansion outside the city and development of real estate.

The Advisor's recommendations on the financial strategy to be followed are:

- Decrease the tariffs in order to improve the competitive position and to benefit the port users;
- Decrease the revenue share in BOT contracts in order to attract terminal operators;
- Invest in port infrastructure according to the landlord port model, in order to decrease the investment costs for the port operators, therewith making the port attractive for additional operators as well (increase of competition). Terminal handling charges could then also be lowered, which is beneficial for the port users;
- Define and implement additional projects; especially in the period 2012-14.

Selected projects and action plans

All Consultants presented extensive analyses and proposed many projects. However, it was not always clear which ideas originated from the Port and which ideas were contributed by the Consultant. Many projects were derived from the NMDP programme, while few innovative ideas were proposed.

Final Conclusions

- There is high growth;
- There is strong demand;
- There are sufficient funds within the ports;
- There are sufficient private funds;
- Main players have strong interest in India.

Although it will be an exercise of major magnitude, involving a long process, it is clear that the main boundary conditions are there to establish a new port system and to implement major works which would transform the Indian Major Ports into world class facilities.

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1 Introduction

The national economic development of India requires a well functioning seaport system. India has 12 major seaports and 185 minor seaports along a coastline of over 7.000 km. The 12 Major Ports handle some 75% of the total Indian port traffic. Due to the foreseen national economic development in the coming decades, a strong further growth of the Indian port sector is expected.

To be able to cope with the above, the Government of India not only decided to improve the seaport and hinterland infrastructure but also the institutional and organisational structure of the port sector.
The overall goal of the development of Business Plans for the 12 Major Ports was:

"To transform Indian ports into world class facilities suited to the requirements of the future economy of India"

The Ministry of Shipping, Road Transport and Highways (MOSRTH), which Ministry is responsible for overseeing the 12 Major Ports in the country, has mandated that each of the 12 Major Ports develop a Business Plan. Subsequently each of the 12 Major Ports engaged consortia of international and national Consultants to:

1. Prepare a Business Plan for the port that can be implemented without any government financial support;
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The Indian Ports Association awarded the Port of Rotterdam in March 2006 the contract to act as Advisor to review the process and results of the preparation of the Business Plans of the 12 Major Ports. The Final Business Plans of the 12 Major Ports were submitted in the period of March-April 2007.
This consolidated port development plan provides an overview of the work done by the Consultants. Where the Consultants presented a 'helicopter view' for each port for the next 7 years, the Advisor herewith presents the overall picture or 'satellite view' for all Major Ports.

The following remarks need to be made with respect to this report:

- This report, consisting of 2 volumes, is kept as condensed as possible, in view of the enormous scope of the project. It is written for the Indian Ports Association / MOSRTH and other readers are expected to have a basic knowledge of the Indian port sector. For more detailed information, reference is made to the 12 Final Business Plans and where needed to the underlying Interim Reports and Inception Reports;

- Volume I, the main report, presents the findings, conclusions and recommendations of the Advisor, based on the 12 Final Business Plans. The cargo forecasts, the financial projections, the mission statements etc have been gathered, and for the overall Major Port sector analyses have been made;

- It was not the task of the Advisor to appoint locations for new port development or to indicate which activities need to be carried out by each Major Port;

- In Volume II the Advisor has summarised each Final Business Plan in an Annex for each port. It should be noted that most parts in Volume II are therefore quotes from the Business Plans made by the Consultant. Where needed the Advisor has presented his specific comments. Each Annex is finalised by the review made by the Advisor on the Final Business Plan. This review has been submitted before, directly after the approval of the Final Business Plan;

- When in this report the Port Trusts are mentioned in general terms, it means that also the Port of Ennore is included, although the Port of Ennore is a Port Company;

- The currency used in this report is Indian Rupee. Ten million rupees or Rs 1 Crore is approximately USD 213.000 (August 2007);

- Small differences in tallying for the Cargo Forecasts are the result of rounding off by the software used;

- Starting points for the Traffic Forecasts might be different, however this does not affect the forecasts.

2 Observations on the project

2.1 Aim of the project and parties involved

The Ministry of Shipping in MOSRTH of the Government of India has mandated that each of the 12 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;
- Identifies sources of financing for all proposed investments.

To this end each Major Port selected a Consultant. As can be seen from the figure below, the Port Trust concluded a contract with this Consultant. On behalf of the Ministry of MOSRTH, the Indian Ports Association (IPA) concluded a Contract with the Advisor. The Consultant therefore officially reported to the Port Trust, while the Advisor reported to the IPA. Obviously there was also much contact between the parties along the non-official lines, which was in favour of the progress of the project.

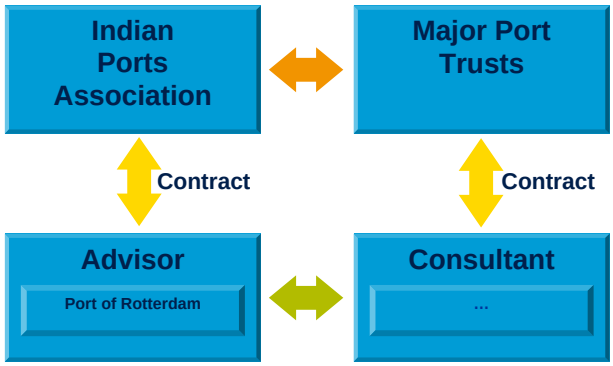

Figure 2.1 Scope of the Project

The implementation of the assignment started in March 2006 with a meeting in Mumbai where all Major Ports were represented and where the Advisor assisted the Port Trusts in the process to select Consultants. The activities of the Advisor were executed in close co-operation with the nodal officer being the Managing Director of IPA and his staff.

The role of the Consultant was to:

- Provide a fresh look on port development;
- Compare with international benchmarks;
- Provide an independent validation of the Business Plan;
- Involve counterpart personnel and transfer knowledge.

The Business Plan should include:

- A long term vision for the port;
- The goals to be achieved over the next 7 years;

- The strategy to achieve these goals;
- A detailed plan of action;
- Financial projections;
- A foundation for an annual planning process (the financial model).

For the 12 Major Ports Consultant teams from seven different Consultancy companies were selected. Most teams were from well known international companies with a good reputation. In general the Indian branch offices from these companies conducted the work, whereby in some cases experts from abroad were involved. In case the Consultancy company was not represented by a branch office in India, it teamed up with a local Consultancy company. The Consultants had various backgrounds, unfortunately not all related to strategic port planning processes. In some cases this resulted in reports which focused too much on the less relevant core-business of the Consultant, or in reports whereby essential topics were not covered. This lead to necessary extra work and time, resulting in revised reports.

The scope of work for the Advisor was:

- To assist the Port Trusts in developing a shortlist of Consultants;
- To provide a briefing on the approach and planning of the project in each port;
- To review the reports of the Consultants and participate in presentations to the ports,
- To ensure counterpart personnel is involved;
- To visit all ports;
- To prepare a consolidated port development plan;
- To organise seminar on the findings of the project, in co-operation with IPA.

2.2 Phasing

The review of the reports submitted by the Consultants was by far the most time-consuming part of the assignment. The preparation of the Business Plans was executed in four phases, each concluded with a report.

1. Inception phase, providing a description of the actual situation;
2. Interim phase, providing an overview of planned improvements;
3. Draft final phase, providing a draft Final Business Plan;
4. Final phase, providing a substantiated Business Plan.

The Inception phase was concluded in October 2006 and main observations were reported by the Advisor to IPA. The Interim phase was concluded in December 2006 with presentations by the Consultants for each of the 12 ports. The Draft Final phase was concluded in March 2007 with the presentations given by the Consultants on their work. The Final phase was concluded in the beginning of April 2007.

On the 4th of April the Advisor presented his findings during an internal seminar in Delhi, inaugurated by the Honourable Minister Baalu of MOSRTH and chaired by the Secretary of Shipping Mr Mohapatra. During this seminar Ministry officials, port officials, the Consultants and the Advisor were present.

2.3 Results

As stated above, the reports differed substantially due to the various backgrounds and related experience of the Consultants and not all reports were of sufficient quality from the start. In a few cases a major effort needed to be made by the Consultant to improve the report. Nevertheless, in general the Consultants did a good job under a high time pressure.

The advantages of appointing an Advisor to co-ordinate and monitor the work done by the Consultants also became clear during the process, in particular after the Inception phase. The Advisor could control a certain quality level for all Business Plans, an approach to be followed in all ports and a format which facilitated the drafting of a consolidated port development plan. In addition, the Advisor could pay special attention in cases of a combination of a less critical Port Trust and a less experienced Consultant, to avoid a Business Plan of insufficient quality. Other regular activities were the participation in the discussions in India during meetings and presentations of the results of findings by Consultants. In addition the Advisor provided - where needed – recommendations and suggestions with respect to various issues of the project, such as long term masterplanning, port land use, calculation reviews on cargo handling operations, logical sequencing in the set up of the Business Plan, reviews of calculation financial feasibility, relation between the projects and the financial accounts, consistency of financial data etc.

The monitoring and review process of this major exercise can be summarised as follows:

- The Consultants have taken the comments made by the Advisor into account. Thanks to the IPA and the Port Trusts, the phases of the development of the Business Plans were followed parallel, whereby not one of the ports was lagging too much behind, compared to the other ports;

- The aim of the Business Plan was to provide a stand-alone report in which all aspects that need to be included were covered. This meant that the Consultant needed to include parts of the Inception and Interim Report in order to be complete, but in a condensed or summarised way. Many Consultants summarised too little of these parts of earlier submitted reports, with the result that the some Business Plans are too bulky, with too many details and not well structured;

- Obviously the quality of the Business Plans varies to some extent. Most reports are informative and contain many analyses. Some reports are of high quality. The format as provided by the Advisor was followed by all Consultants;

- In spite of improvements made during the process, in general illustrative material was of moderate quality; maps of ports and hinterland regions,

port lay outs, expansion plans, master plans, operations and logistics schemes, etc;

- Vision, mission and strategy have been defined for all ports, but in earlier stages of the project, these were not always translated into port development plans and projects. All missions and visions appeared to be ambitious and most of the ports want to become the most important or best port in their regions. The port user however, is not mentioned very often in these missions and visions;

- The cargo forecasts were generally of good quality. Most Consultants based the forecast on an analysis by commodity of historic trends; international, national and local developments; and competitive position. Most Consultants took the existing cargo mix as a basis for future forecasts; some also considered development of new cargo types. Iron ore and containers are the most competitive markets and the forecasts for these commodities were subject to most discussions. In particular iron ore is difficult to forecast, since the policy of the Government on this commodity is still uncertain. This led to Consultants taking into account a decrease in iron ore throughput, while others forecasted a strong increase;

- During the earlier phases of the project, cargo forecasts were often not translated in a transparent way into requirements for additional quays, improved cargo handling facilities or hinterland connectivity. This was corrected afterwards;

- A land use plan was developed in most ports. However, a clear vision on port planning and phased development is lacking for some ports. Development of a detailed strategic port master plan – beyond the scope of this project – was recommended for a few ports;

- All Consultants presented extensive analyses and proposed many projects. However, it was not always clear which ideas originated from the Port and which ideas were contributed by the Consultant. Many projects were derived from the NMDP programme, while few innovative ideas were proposed;

- It was the impression of the Advisor that the co-operation between the Port Trusts and the Consultants had improved during the process. Some Consultants and Port Trusts acted as one team. There were also Port Trusts who were not on one line with the Consultant;

- Near the old city ports of Mumbai, Chennai and Kolkata new satellite port have been developed (JNPT, Ennore, Haldia) to allow future expansion, deep draft and high volume cargo handling. In general little synergy between the ports were proposed. In particular in the case of Mumbai and JNPT this was expected since both Business Plans were prepared by the same Consultant;

- In a number of cases the profitability of the Port Trust as State Enterprises has been highlighted in the considerations on port planning and action plans. Visions and goals refer in general to more ambitious strategies to facilitate trade, national and regional economic developments. In general investments of the facilitating Port Trust are minimal compared to those indicated for port terminal companies and port users;

- The financial models prepared by the Consultants were in general of good quality. It is essential however that the working of this model is explained extensively to the counterpart team of the Port Trust in order to adjust the Business Plans in the near future;

- In general several organisational improvements were presented, however institutional improvements were mostly not included in the report;

- The Consultant has performed his scope of work as outlined in the briefing to the Consultants by IPA and Advisor at the start of the project, to a satisfactory level. Although the Advisor could not be involved in the day-to-day co-operation between the Consultant and the Port Trust, the Advisor is of the opinion that counterpart personnel of the Port Trust has been sufficiently involved. Furthermore the Advisor considers that the Financial Model as prepared by the Consultant can serve as a management tool to adjust the Business Plan in the future where needed.

3 Vision and Strategy

Not all ports have presented their mission, vision and strategy in this strict sense, in some cases one of the three is lacking or objectives and/or goals have been added. Nevertheless, it is clear what the ambitions of the 12 Major Ports are. They are listed in the table below:

Kandla	**Vision:** Kandla Port will emerge as a vibrant, world class, multi-cargo port offering services at multiple locations and having a dominant share of regional cargoby virtue of its ability to effectively leverage its locations and land resources for facilitating growth of economic activities and investments, with the objective of developing mutually beneficial and sustainable linkages with port based industries and users, thereby making Kandla the driver of economic growth in the region
Mumbai	**Vision:** To be amongst the leading world-class multipurpose city-based ports in South-East Asia by 2025
JNPT	**Vision:** To be recognized as India's premier container port providing integrated logistics services to the best interest of trade and customers
Mormugao	**Vision:** MPT wishes to be the preferred port for the region, recognised for its environmental policies, efficiency in cargo handling and service to customers, providing quality of life for the workforce and support the community
New Mangalore	**Mission:** To become a leading liquid and multi-cargo port by adopting state-of-the-art technology infrastructure and cargo handling systems, complying with environmental, social, safety and security standards **Vision:** To be a professional provider of Port Infrastructure and Services of world class standards
Cochin	**Mission:** The Port of Cochin is the gateway to the West Coast of India **Vision:** The vision of Cochin Port Trust is to see itself, over the next twenty years, serving the country as: 1. A Business Enterprise 2. An Economic Development Facilitator 3. An Environmental Conservator 4. A Public Service Provider

Tuticorin	**Vision:** To be the Preferred Distribution Hub of India **Mission:** TPT shall be South India's Quality leader in General and Bulk cargo and the High Speed Container Pipeline Provider for the Indian backbone
Chennai	**Vision:** To be recognized as a futuristic port with foresight **Mission:** ▪ Achieve excellence in port operations with state-of-the-art technologies. Enhance competence and enthuse workforce to maximise customer satisfaction ▪ Anticipate and adapt to the changing global scenario ▪ Act as a catalyst for sustained development of the region
Ennore	**Vision:** Develop as a mega port with world class facilities to become the Eastern gateway Port of India **Mission:** To execute the following projects (see Volume 2, ch 9.1) selected to meet the traffic demands and to provide the supporting infrastructure
Visakha-patnam	**Vision:** VPT to be the most preferred port in South Asia offering services of global standards **Mission statement:** To be a major partner in meeting the logistics requirements of the importers and exporters in the region **Brand:** The East Coast Gateway
Paradip	**Mission:** to facilitate the trade with cost effective services while maximizing the taxpayers' funds ▪ Paradip Port Trust (PPT) has a high potential to become a leading Hub Port of the Indian East Coast and an economic thrust engine for the Eastern part of India within the next 15 to 20 years ▪ This can be attained by leveraging core strengths and values such as the high draught potential, the rich minerals hinterland, and the developing economy ▪ PPT is a Public service entity, hence, adding value to the stakeholders (People of the Country) by facilitating the economic development and offering cost-effective

	services, should be the key mission of the Port ▪ For PPT, the market offers a potential volume of 130 to 190 million tonnes (M tons) of cargo at a Compounded Annual Growth Rate (CAGR) of 6% to 8% in the next 20 years. This would place the Paradip as a leading bulk terminal Port in the world ▪ The Port will have a stable and sustainable growth during 2017 to 2027 at a CAGR of 4% to 6%
Kolkata	**Mission statement:** The mission for KoPT is to be at the top of 3 Major Ports of the country in terms of profitability starting by 2008 by highlighting the focus on efficiency along with high traffic volumes. **Vision:** Kolkata Port should be developed as a customer friendly self sustaining port providing integrated quality services to its customers while retaining its position as a major sea-river gateway for the Eastern region of India.

Table 3.1 Missions & Visions of the 12 Major Ports

Summarised, the key words of these statements are the following:

- Kandla: world class, multi-cargo, driver of economic growth;
- Mumbai: leading world class, multipurpose city based port in SE Asia;
- JNPT: India's premier container port with integrated logistic services;
- Mormugao: preferred port for the region;
- New Mangalore: a leading liquid and multi-cargo port;
- Cochin: gateway to the West Coast of India;
- Tuticorin: preferred distribution hub of India;
- Chennai: futuristic port with a foresight;
- Ennore: to develop as a mega port, Eastern gateway;
- Visak: the most preferred port in South Asia;
- Paradip: cost effective, maximise taxpayers' funds;
- Kolkata: major sea-river gateway, quality services.

An analysis of these statements provides the following picture:

- All ports are ambitious, all have an offensive approach, not one is defensive in the sense of trying to maintain markets share for example;
- Quality of services and facilities is mentioned ten times;
- Nine of the Major Ports want to become the leading or best port in the region, India, or South East Asia;
- (Only) seven ports mention their orientation towards the customers;
- In two ports the making of profit is one of the main driving forces.

The following chapters will deal with the translation from these mission statements into (improved) port facilities, infrastructure and organisation.

4 Competition

4.1 Benchmarking

4.1.1 Characteristics Major Ports in India and NW-Europe

Since the overall goal of the development of Business Plans was that the Indian ports should be transformed into world class facilities, one of the important aspects the Consultant had to cover in his work was to provide benchmarks. In this respect the Advisor also made a comparison between the Indian ports in general and the Northwest European ports. In India there are 12 Major Ports in the Kandla – Kolkata range, over a coastline of some 7.000 km, while the Northwest European so called H-H range (Hamburg – Le Havre) covers 11 Major Ports over a coastline of some 1.000 km (see figures below).

Figure 4.1 The 12 Major Ports of India

Figure 4.2 The HH-Range

The following comparisons can be made:

	KK-range (Kandla – Kolkata)	HH-range (Hamburg – Le Havre)
Coastline	7.000 km	1.000 km
Number of Major Ports	12	11
Cargo handled in 2006	420 M tons	1.020 M tons
Hinterland - population	1.100 million	200 million
Competition	limited	strong
Port management	Public services ports with private terminals	Mostly landlord
Role of the private sector	weak	strong
Cargo handling equipment	Mostly outdated	modern
Port infrastructure	(almost) at capacity	Spare capacity available
Marine services	Public, mostly old equipment	Mostly private
Hinterland connections	Road and rail, insufficient supply	Road, rail, IWT and pipeline, fierce competition
Industrial port clusters	absent	Several (a.o. Rotterdam, Antwerp)
Logistic clusters	Coming up (SEZ's)	Available, also within the ports

Table 4.1 Comparison KK-range and HH-range

Worldwide the trends with respect to port infrastructure are:

- Port development takes place in deeper water due to the trend of larger vessels applied;
- Economy of scale is applied with the focus to decrease the costs per unit, which lead to larger projects;
- Industrial clusters are established to obtain synergy and achieve more efficiency;
- Logistic clusters are established in or near ports, also to achieve more efficiency;
- The role of the private sector is increasing.

Looking at these trends it is clear that the trend towards economy of scale fits perfectly with the Indian situation. The availability of natural deep water is a problem, but there is room for large scale industrial and logistic clusters, while the Government also promotes an increasing role of the private sector. Hence several boundary conditions for the Indian ports to be transformed into world class facilities are there, but there is still a major effort to be made. At present the Indian port sector can be characterised as follows:

- The port sector is quite a peculiar market: the 12 Major Ports, falling under the Ministry of MOSRTH, have a market share of some 75%, and therewith form a kind of cartel. Major decisions with respect to tariff setting and investments to be made in infrastructure for example, are made in Delhi. Traffic forecasts are made in Delhi as well and in some ports there is the feeling that these forecasts are a target or obligation that needs to be fulfilled. The Major Ports do not or hardly compete with each other, and all or most information is shared, including strategic objectives and goals. There is a limited level of autonomy;

- Due to scarcity of port facilities, the port sector is a demand market;

- This is also reflected in the role of the private sector: huge revenue shares are offered to the Port Trusts in order to obtain the possibility to become operational in the port. The BOT principle, almost nowhere applied in its purest sense, namely that the private sector invests in all infrastructure, is applied in India. As such the Port Trust has limited investments to make – mostly dredging – but in return receives high revenue shares from the private sector;

- In general and at least until recently, the ports were ‘berth minded’. This means that as soon as a port was reaching capacity, the decision was taken to construct (an) extra berth(s). The present performance or efficiency on the berths was not often taken into account, while here the cheapest and fastest port capacity increase could be achieved;

- Minor ports, public ports falling under the States, are sometimes becoming a fierce competitor for the Major Ports;

- The biggest threat is the development of private ports, not hampered by old infrastructure, bureaucratic procedures and inefficient cargo handling systems;

- Fortunately the newest Major Ports like JNPT and Ennore, serve as an example for the other Major Ports with respect to efficient cargo handling operations. JNPT in fact already reached the goal of becoming a world class

facility. Ennore, still having much port area, has the potential to become a world class facility, on the condition that careful long term planning is taken into account.

4.1.2 Generations of ports

From the comparison of the markets it is clear that India, with its strong economic growth, is on the brink of a strong increase of cargo throughput in the ports. It is doubtful whether the Major Ports are able to match this future flow and therefore it is expected that – at least on the short term – the Major Ports will lose market share in favour of the minor ports and the private ports.

An interesting comparison between the Major Ports in India and Northwest Europe can also be made on the basis of classification of ports according to generations, as is developed by UNCTAD in the past. This classification should not be confused between main ports and feeder ports. The size of the port is not the decisive factor but the character of the port and the attitude and the approach of the port management related to port development play an important role. The generations are as follows:

- The first generation of ports relate to ports where only cargo handling takes place. This is the classical type of port, where only the core-activity of a port is carried out. None of the Major Ports in Northwest Europe still is of this generation, while in India most of the Major Ports can be classified as such;

- The second generation of ports relate to ports where, apart from cargo handling of course, also an industrial cluster is established. The industries import raw materials or half-products and process these to semi-finished or finished products which are exported again. Often the product of an industry is used as feedstock for a neighbouring industry, hence optimum use is made and synergy achieved between industries, industrial services providers and port facilities. In most Northwest European ports an industrial cluster of some size is present, while in the Indian Major Ports these are mostly absent. There are some industries in some ports, but to a limited extent and mostly existing of power plants and refineries;

- In a third generation port the cargo handling remains the backbone of the port. Besides representing an industrial cluster, the port is also an integrated platform for trade, logistics and distribution activities. The characteristics of such a port are:
    - Change in management approach from a rather passive offerer of facilities and services to active concern and participation in overall trade process;
    - Modern handling equipment;
    - Availability of industrial, environmental, administrative, and commercial services;
    - Logistic/ distribution services: districentres, EDI, value adding activities, simplified custom regulations.

- From the mission statement of JNPT (see chapter 3) it is clear that the ambition is to become a port of the third generation. Other Major Ports have not (yet) expressed this ambition.

4.1.3 Employment

Another interesting comparison can be made with respect to employment in the port. In the final Business Plan for the Port of Kolkata, the total number of employees in the Major Ports are presented for the year 2005. Since the total amount of cargo handled in the Major Ports in that year was almost the same as the cargo handled in the Port of Rotterdam (370 M tons), an interesting comparison can be made. The differences are considerable:

- Employment: in the 11 Port Trusts the total number of employees in 2005 reached 66.000 persons. The Port of Rotterdam Authority employs 1.200 persons, which obviously is far less due to the fact that the port is a landlord port. The Port of Rotterdam Authority is therefore not engaged in cargo handling activities and most of the nautical services;

- Out of the 66.000 persons mentioned above, 21.200 persons were cargo handling workers. Not included in this number are the cargo handling workers employed by private BOT operators. Total number of cargo handling workers in the Port of Rotterdam reaches 6.000. These are employed by private port operators. This is a remarkable difference, since the total mixture of commodities in the Major Ports and Rotterdam is comparable. The main reason for this difference is the highly mechanised and automated cargo handling systems applied in Rotterdam;

- The total direct employment generated by the Port of Rotterdam is 70.000 persons (authorities, private port operators, agencies, customs, nautical service providers, industries etc). This figure is of the same order of magnitude as the 66,000 persons employed by the 11 Port Trusts, but the difference is that they are divided over many companies, authorities and organisations;

- The total number of indirect employment in Rotterdam is 300.000 persons. Hence for every job within the port, four jobs outside the port are generated. As a third generation port and therewith a platform for international trade, the Port of Rotterdam serves as a generator of employment. The port contributes for 7% to the Dutch GNP, which is US$ 46 billion. Figures for indirect employment in India are not known.

4.1.4 SWOT-Analysis

Looking at the competitive situation in the Major Ports in India, the following can be mentioned:

- Inter-port competition is limited as far as the other Major Ports are taken into account. The inter-port competition with the private ports is getting stronger;
- Intermodal transport competition: there is road and rail, but supply is insufficient and inefficient;
- Within port competition: mostly absent (JNPT is an exception, with three container terminals);

- Competition with international ports: for a ship call of a 3000 TEU vessel JNPT is four times more expensive as Colombo. This is comparable with the other major Ports, hence the Indian ports are not attractive for international transhipment.

All Consultants have made a SWOT analysis for their port. Many of these analyses have been performed through workshops involving the various stakeholders of the ports. Other Major Ports were usually taken into account, also because the ports are well informed about each others plans and strategies. Other developments such as the construction of new private ports was usually briefly mentioned and the impact on the respective port could not, or in most cases was not, established. Only once, and then in the interim phase of the process, a port made estimates of the future market shares, thereby taking into account minor as well as private ports. The role of minor ports as present or future competitors was not mentioned very often.

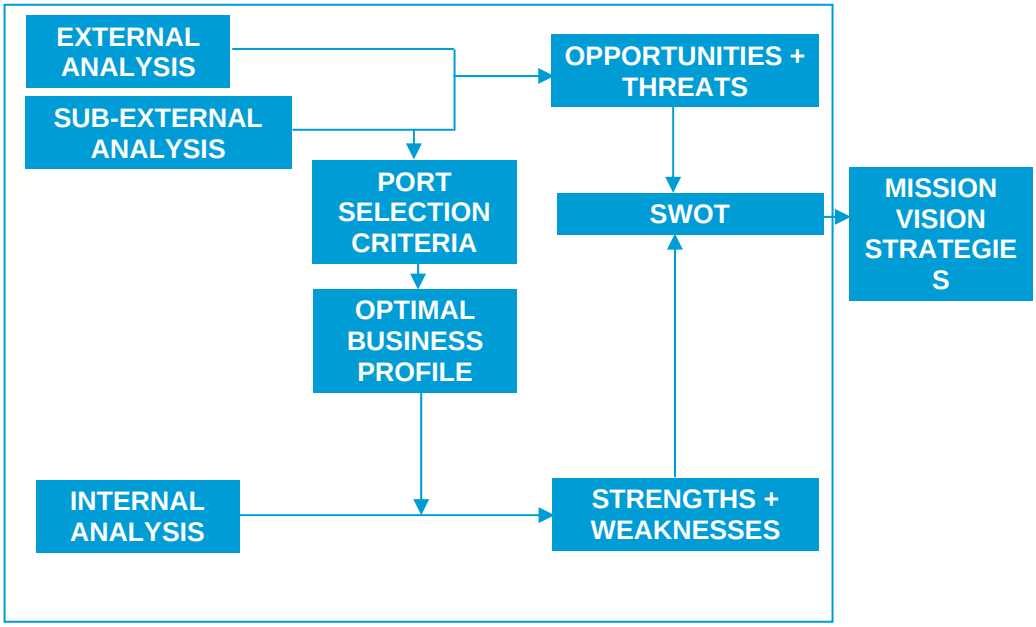

Figure 4.3 Strategy Development Process

In general the Consultants have followed the scheme shown above, which is more or less the internationally applied methodology for a SWOT analysis.
In this methodology a list of opportunities and threats are obtained from an external analysis (macro-economic situation, trends and expected relevant changes) and a sub-external analysis (port related, involving the transport business, technological, industrial and logistic developments, trends related to the various commodities, competition, etc). A list of strengths and weaknesses is obtained from an internal analysis, looking at the overall performance and facilities of the port, the commercial attitude of the management etc, and these compared with the optimal business profile the 'world outside', the port users, would like the port to have. On the basis of the strengths, weaknesses, opportunities and threats a realistic mission statement, vision and strategies can be determined. For the 12 Major Ports these have been listed in chapter 3. As has been outlined in this chapter, all ports are ambitious, focusing on growth, which

seem to be justified taking into account the strong economic growth in the country.

For the SWOT analyses of the 12 Major Ports reference is made to Volume II. The Advisor herewith presents his own SWOT analysis of all Major Ports:

Strengths	Weaknesses
▪ High growth ▪ High market share ▪ Financial means available ▪ Most ports located at strategic locations	▪ Old infrastructure ▪ Limited water depth ▪ Old and inefficient cargo handling systems ▪ Poor hinterland connections ▪ Rigid institutional framework ▪ High tariffs ▪ Poor quality of services / business attitude ▪ Overstaffing ▪ Lack of capacity ▪ Lack of extension possibilities
Opportunities	**Threats**
▪ Introduce competition ▪ Huge Indian market, and landlocked countries in the North ▪ Improve organisation: training, IT, downsizing ▪ Port reform – more autonomy ▪ PPP other than BOT ▪ Invest in infrastructure, lower costs for port users ▪ Invest in total transport chain	▪ Private ports ▪ Minor ports ▪ Bureaucracy ▪ Time

Table 4.2 Advisor's SWOT-analysis for all major Ports in India

5 Cargo Forecast

5.1 General

The Consultants prepared Final Reports including cargo forecasts for the individual ports. The horizon of the cargo forecasts appears to be the reference years 2025-26.

The methods of determining the cargo forecasts in the Final Reports have basically taken into account the following main factors:

- Historic and actual throughputs in terms of types and volumes of commodities;
- Growth of GDP of India and the region;
- Particular developments in the hinterland of ports.

Based on these factors the potential forecast of a region or a port was assessed.

In order to realise the potential forecasts possible limitations of the individual ports were assessed. These limitations can be of different nature.

- Physical limitations;
- Institutional limitations;
- Competition.

Examples of physical limitations are limited water depth, shortage of space, poor hinterland connections, environmental restrictions, surrounding urban areas. An example of institutional limitation is the possible restriction set by the GoI on the exports of the highly demanded iron ore for the benefit of the steel producing industries in India. With the strong growth of the economy and of the potential forecast, it is logical that competition is introduced. Existing and/or new minor (state) and or private ports will be developed aiming at the same sources of cargoes and aiming at serving the Indian producers and consumers.

In these considerations captive markets have been defined as those market segments of goods more or less forced to use the port for their supply chain of goods. The captive market determines the catchment area within which cargo will be routed via the port in general without hesitation.

The expected traffic scenarios for the individual ports are generated by the various Consultants taking into account these considerations to various extents.

The main commodities handled via the Indian Major Ports are the following:

- Dry bulk: Iron ore and coal;
- Liquid bulk: Crude oil and oil products (POL);
- Containers.

Apart from these main products a large range of raw materials, semi finished products and general cargoes appeared in the individual forecasts.

The forecasts for the individual ports as prepared by Consultants have been consolidated as an overall forecast for India per main commodity. This consolidated forecast per main commodity for all Indian Major Ports is indicated in Table 5.1 for three reference years. The figures have been given in M tons per year. From the table it can be seen that in particular the growth expectation of container throughput is high beyond 2011-12. This particular trend is visualised in Figure 5.1.

	2007-08	2011-12	2025-26
POL	160,66	216,51	335,95
Iron Ore	95,64	108,97	139,52
Coal	74,49	126,68	189,61
Containers	83,88	161,38	679,97
Fertilisers	15,34	19,76	37,20
Other Cargo	80,44	106,11	212,82
Total	**510,47**	**739,41**	**1595,07**

Table 5.1 Consolidated traffic forecasts for three reference periods in M tons

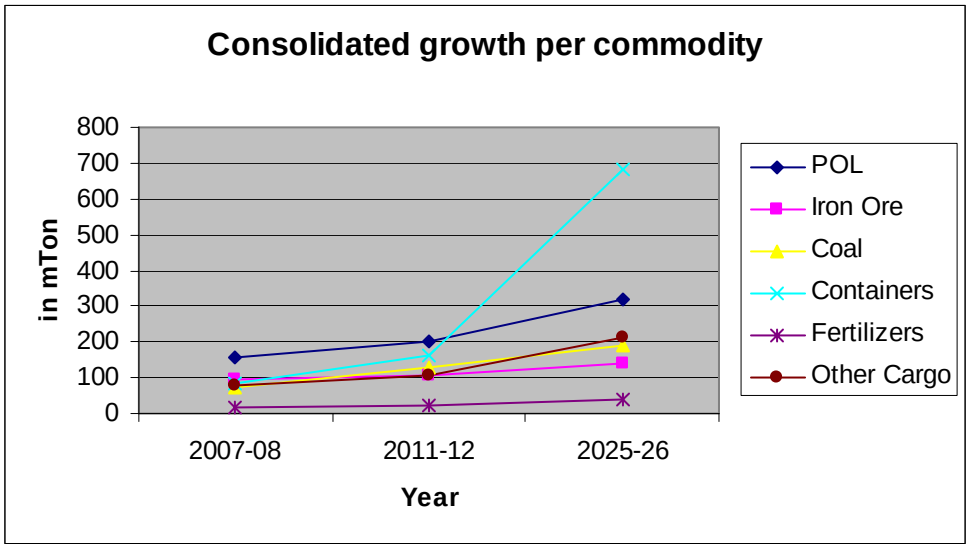

Figure 5.1 consolidated growth per commodity (combined Major Ports)

In addition to the figures for the consolidated forecast for the main commodities for all Major Ports, the total cargo throughput projections per individual ports have been indicated in Figure 5.2 and Table 5.2. The Figure 5.2 indicates particular strong growth expectations in JNPT, Kolkata, Ennore and Kandla.

	2007-08	2011-12	2025-26
Kandla	70,63	98,13	204,51
Mumbai	52,38	76,13	128,61
JNPT	49,98	88,77	305,99
Mormugao	49,15	52,25	78,30
New Mangalore	37,41	52,17	84,14
Cochin	15,36	24,63	53,49
Tuticorin	21,20	30,80	71,80
Chennai	54,75	64,17	87,11
Ennore	11,30	40,64	136,40
Visak	57,70	81,70	146,80
Paradip	45,60	71,55	125,60
Kolkata	45,01	58,47	172,32
	510,47	**739,41**	**1595,07**

Table 5.2 Consultants' cargo throughput projections per port in M tons

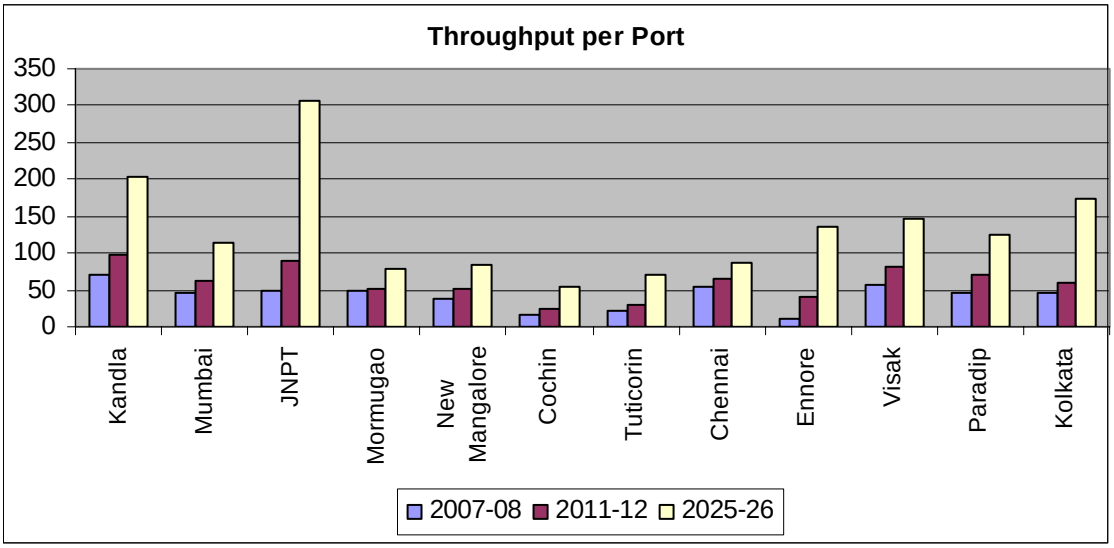

Figure 5.2 Throughput per Port in M tons

For the main commodity groups as listed in Table 5.1, figures have been prepared based on the data provided by Consultants on the throughput per port in the reference years 2007-08 and 2025-26. Reference is made from Figure 5.3 to Figure 5.10.

Note: the arrows in these figures represent the total of the import as well as the export flows in the ports.

Images of projected POL-traffic, to and from, the most relevant Major Ports are indicated for the reference years 2007-08 and 2025-26.

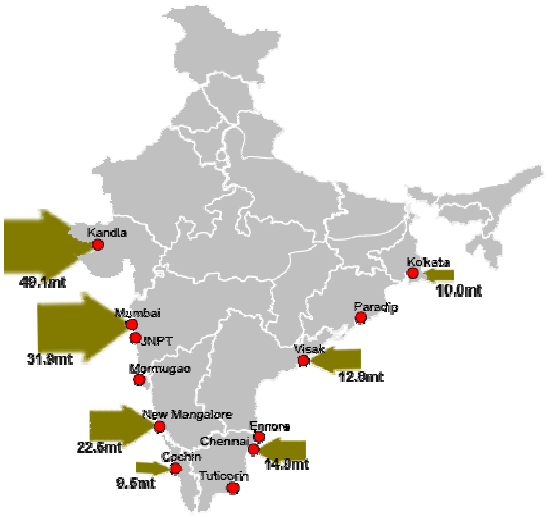

Figure 5.3 POL-Products & Crude 2007-08

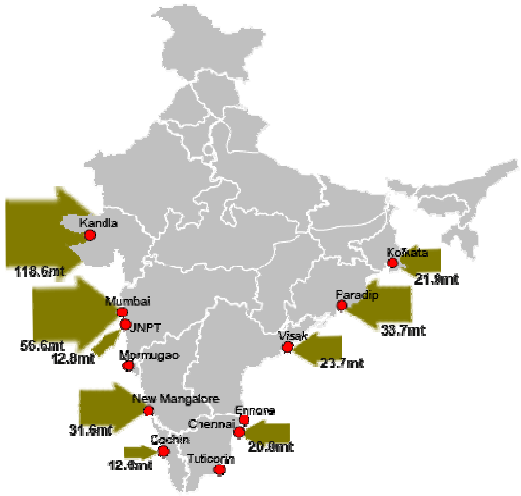

Figure 5.4 POL-Products & Crude 2025-26

Images of projected Iron Ore traffic, to and from, the most relevant Major Ports are indicated for the reference years 2007-08 and 2025-26.

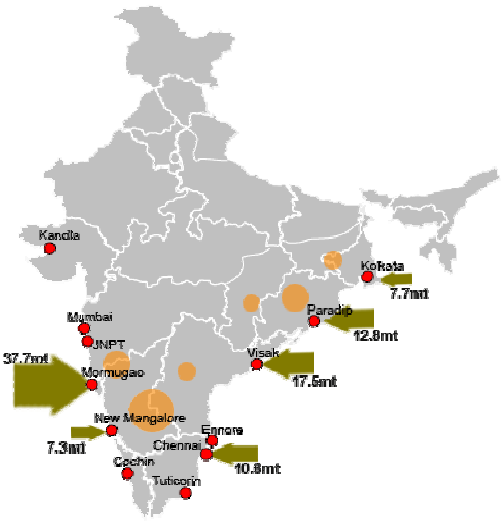

Figure 5.5 Iron ore 2007-08

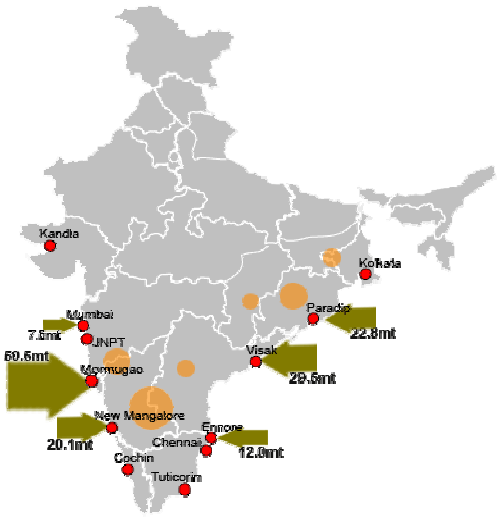

Figure 5.6 Iron Ore 2025-26

Images of projected Coal traffic, to and from, the most relevant Major Ports are indicated for the reference years 2007-08 and 2025-26.

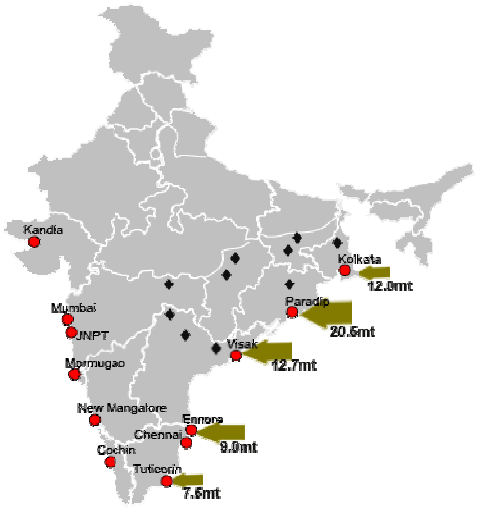

Figure 5.7 Coal 2007-08

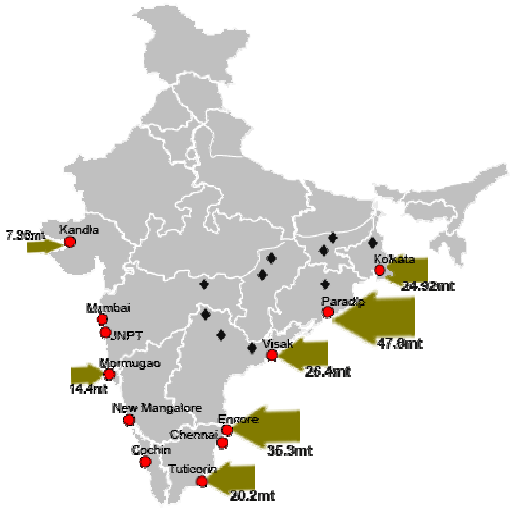

Figure 5.8 Coal 2025-26

Images of projected Container traffic, to and from, the most relevant Major Ports are indicated for the reference years 2007-08 and 2025-26.

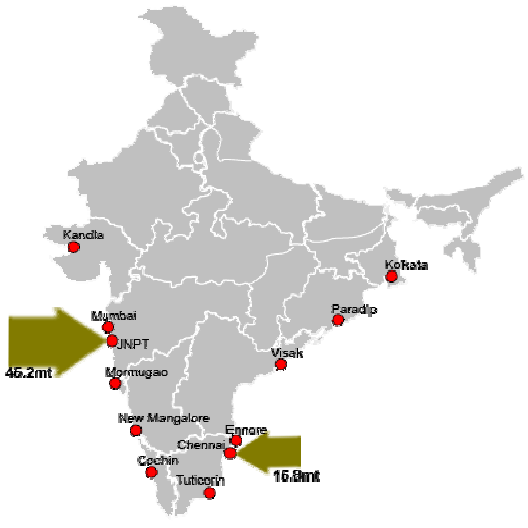

Figure 5.9 Container 2007-08

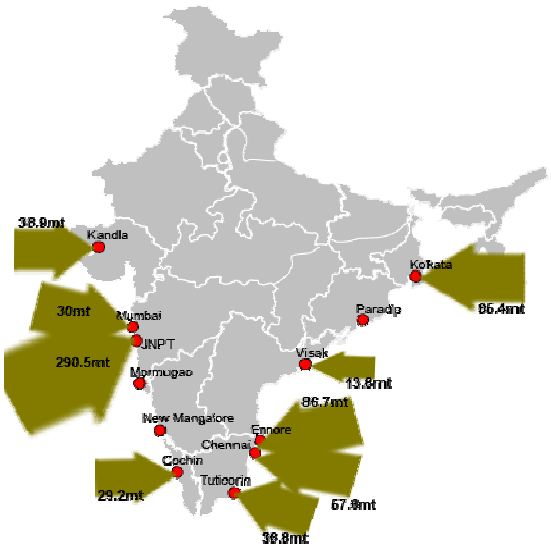

Figure 5.10 Container 2025-26

In the next sections, the Advisor will go more in depth on the forecast of the main commodities.

5.2 POL

India is an important energy consuming country. Oil and gas with a total share of 40% appear to be primary energy sources. POL import amount to some 25% of the total import of India and POL export some 8% of the total export.

	Total
2007-08	160,66
2011-12	216,51
2025-26	335,95

Table 5.3 Consolidated forecast for POL in M tons

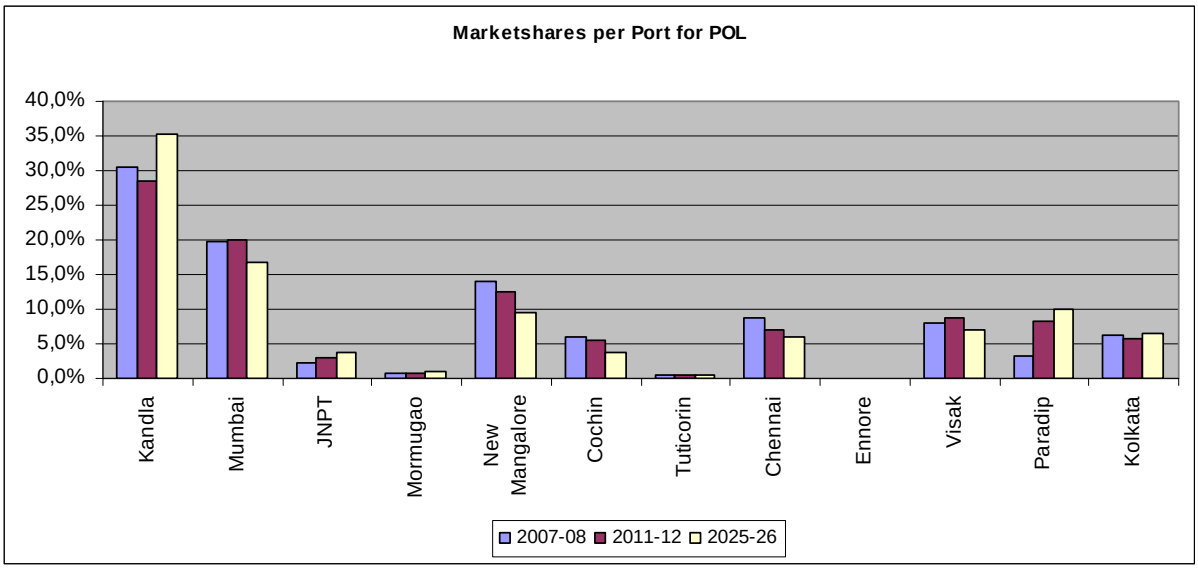

Figure 5.11 Market share per Major Port in handling POL

Table 5.3 shows the consolidated forecast for POL throughput for all Major Ports as derived from the reports of Consultants. Figures 5.3 and 5.4 indicate the forecast of POL throughput for the individual ports. The northwest ports of Kandla and Mumbai and to a less extent the west New Mangalore Port Trust appear to be the prime ports for POL. The location of these ports relative to the Middle East is an explanation.

5.3 Iron Ore

Global trade in iron ore has increased with some 505 M tons in the period from 2001 to 2005. Iron ore import by China has grown by 31% per year in this period in order to feed China's steel industry. Australia and Brazil are prime sources of iron ore. India is another main producer of iron ore catering for the Indian domestic (steel producing) market and for export. The main mining areas are located largely in Eastern and Central India (Jharkand, Orissa and Chhatisgarh) and in Karnataka in South India. Goa and Andhra Pradesh are other iron ore producing areas.

	Total
2007-08	95,64
2011-12	108,97
2025-26	139,52

Table 5.4 Consolidated forecast for Iron Ore in M tons

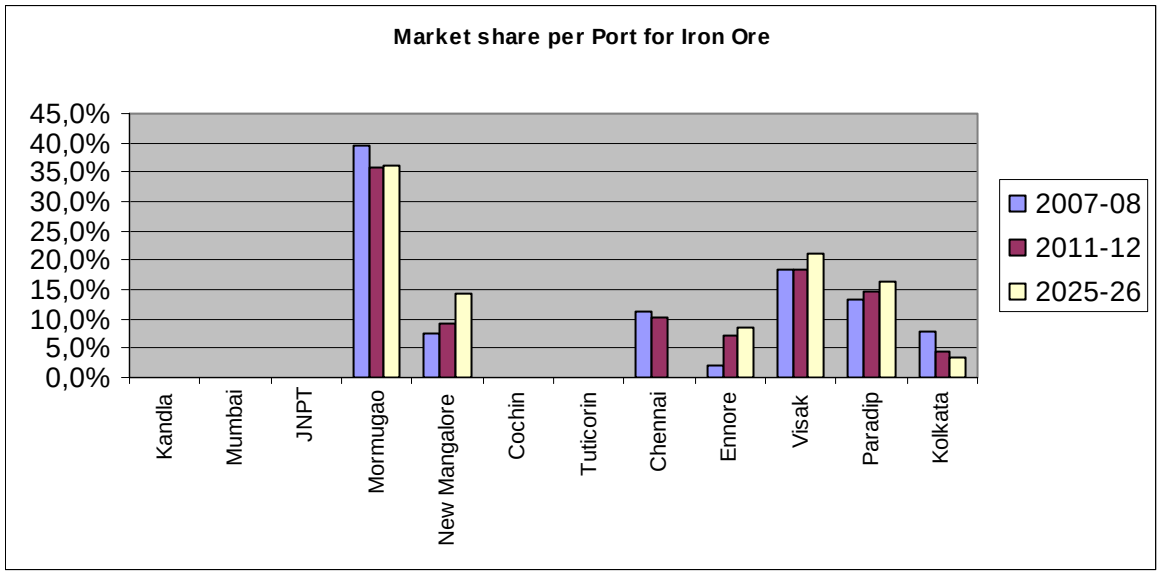

Figure 5.12 Market share per Major Port in handling Iron Ore

Table 5.4 shows the consolidated forecast for iron ore throughput for all Major Ports as derived from the reports of Consultants. Figure 5.12 indicates the market share of iron ore throughput for the individual ports. The Port of Mormugao located near Karnataka and Goa is the dominant iron ore port. The ports of Paradip and Visakhapatnam compete for the overlapping hinterland in East India. Ennore seems to take over the role of Chennai with respect to iron ore exports.

5.4 Coal

Coal production is nationalised at present and private investment in coal mining is only allowed for captive mines supplying coal to designated sectors as power, steel and cement.
Next to crude oil, thermal coal mainly from Orissa is another key energy resource for the power sector. India's coking coal usually lacks the quality needed for steel production. Poor quality domestic coking coal therefore is blended with imported coal.

	Total
2007-08	74,49
2011-12	126,68
2025-26	189,61

Table 5.5 Consolidated forecast for Coal in M tons

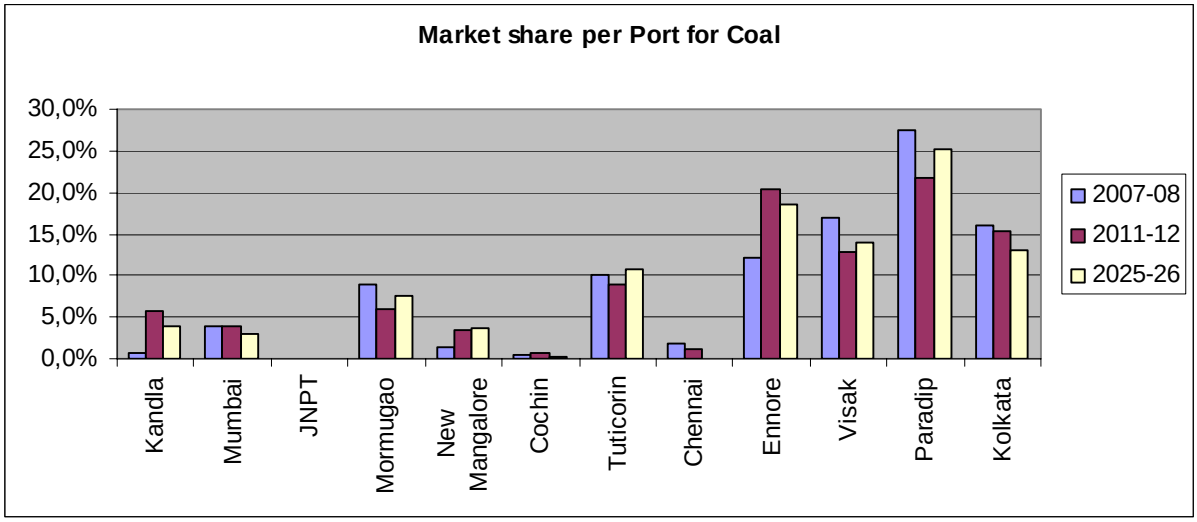

Figure 5.13 Market share per Major Port in handling Coal

Table 5.5 shows the consolidated forecast for coal throughput for all Major Ports as derived from the reports of Consultants. Figure 5.13 indicates the forecast of iron ore market share for the individual ports. The ports at the East coast near the mining areas in particular Paradip appear to be and remain the main coal handling ports.

5.5 Containers

The economic modernisation in India has resulted in strong growth in the value of India's exports. India's export mix is changing with higher value goods (e.g. high tech, pharmaceuticals, engineering and automotive components) growing at a faster pace than resource based and agricultural products. The growth and changing mix of cargoes will logically result in further unitisation of the country's general cargo trades.

	Total
2007-08	83,88
2011-12	161,38
2025-26	679,97

Table 5.6 Consolidated forecast for Containers in M tons

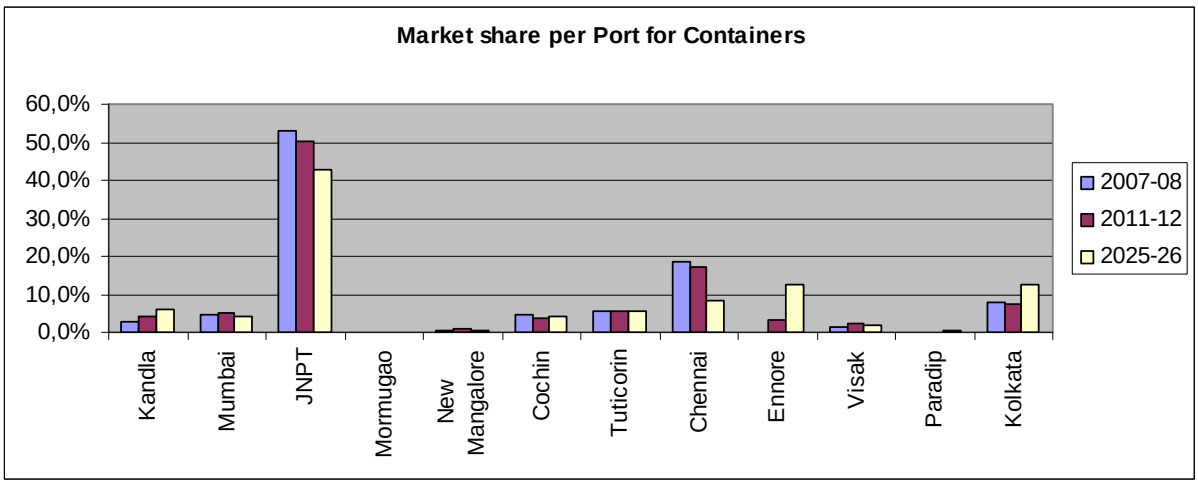

Figure 5.14 Market share per Major Port for handling of Containers

Table 5.6 shows the consolidated forecast for container throughput for all Major Ports as derived from the reports of Consultants. Figure 5.14 indicates the forecast of container market share for the individual ports. Jawaharlal Nehru Port in the northwest with its favourable location towards north India and Delhi is assumed to remain the main container centre of India, although some market share loss is expected. In particular Ennore is seen as a potential container port in the South next to the established centre Chennai.

5.6 Fertilisers

With respect to agriculture, the Government of India policy is focussed on agricultural growth. India is the third largest producer and consumer of fertilisers in the world. Some 60 large size plants in the country manufacture a range of fertilisers. The most widely used fertilisers include nitrogenous (N), phosphoric (P) and potosi (K). Potosi fertiliser is not manufactured in India and is imported. The industry relies heavily on imports for its requirement of raw material. Monsoon holds the key to the future prospects of the fertiliser industry. A good monsoon will spurt food grains production and consequently the demand for fertilisers.

	Total
2007-08	15,34
2011-12	19,76
2025-26	37,20

Table 5.7 Consolidated forecast for Fertilisers in M tons

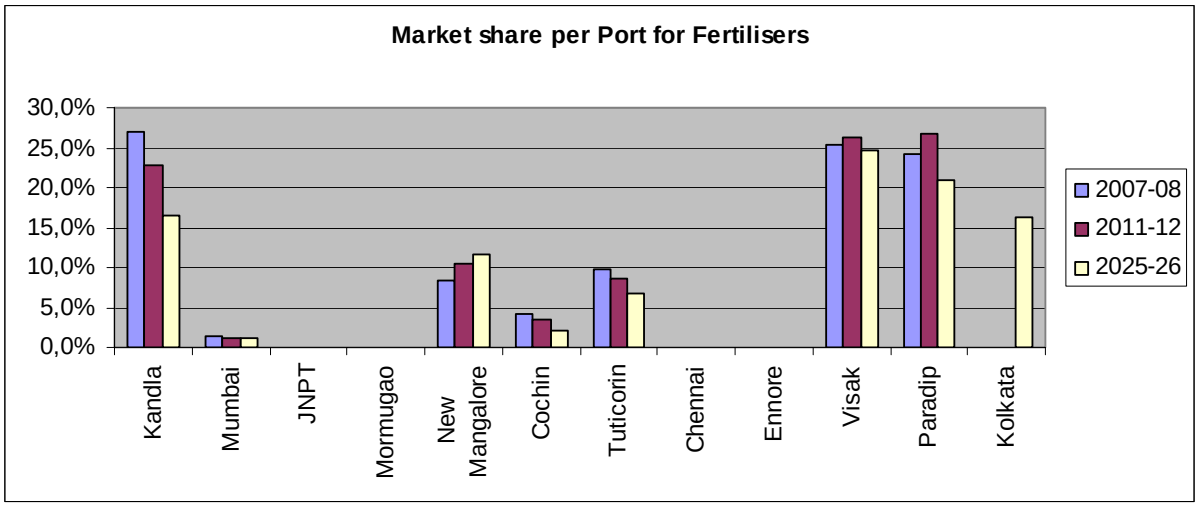

Figure 5.15 Market share per Port for handling of Fertilisers

Table 5.7 shows the consolidated forecast for fertiliser throughput for all Major Ports as derived from the reports of Consultants. Figure 5.15 indicates the forecast of fertiliser market share for the individual ports. The ports at the north east coast appear to be the main fertiliser ports. The location of large agricultural areas in the direct hinterland are an explanation of the phenomena.

5.7 Other cargo

Apart from the main commodities many other commodities are being handled and will be handled in the Major Ports. The following table and figure are related to this variety of commodities.

	Total
2007-08	80,44
2011-12	106,11
2025-26	212,82

Table 5.8 Consolidated forecast for Other Cargo in M tons

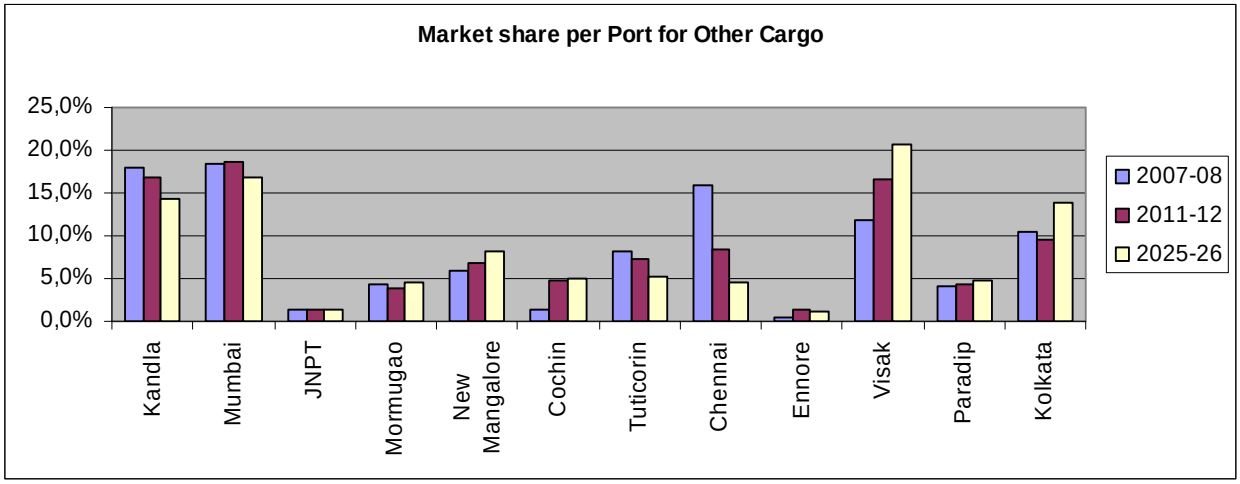

Figure 5.16 Market share per Port for handling of Other Cargo

Table 5.8 shows the consolidated forecast for other cargoes throughput for all Major Ports as derived from the reports of Consultants. Figure 5.16 indicates the forecast of other cargoes market share for the individual ports. The port of Kandla, Visakhapatnam and Kolkata appear to be and remain ports with a strong multi commodity character. Chennai seems to give up this position in line with its planned focus on containers.

5.8 Main observations cargo forecasts

In the framework of the definition of NMDP projects a document was prepared by MSRTH indicating a comparable forecast for the individual Major Ports and an overall forecast. A comparison of the overall forecasts per commodity as a result of the forecasts of Consultants and the MSRTH forecast of 2005 is provided in Table 5.9.

	Consultants	NMDP	Drewry
POL	216,51	183,50	
Iron Ore	108,97	87,50	
Coal	126,68	103,50	
Containers	161,38	140,40	
Fertilisers	19,76	15,60	
Other Cargo	106,11	85,20	
Total in M tons	**739,41**	**615,70**	
Containers M TEU	13,30	11,70	8,40-10,80

Table 5.9 Comparison of forecasts per commodity for Major Ports for the reference year 2011-12 in M tons

Deviations are apparent with a higher overall forecast foreseen by Consultants for all listed commodities. This difference can be explained by two main reasons. In the first place the forecast of Consultants has been prepared in 2006 two years later than the one of MSRTH – NMDP. These last two years showed a strong growth of the Indian economy and consequently of a strong growth in trade and transport. The 2006 forecast obviously takes into account the positive experiences of the last two years. Secondly the individual ports are aiming at market shares in overlapping parts of the potential hinterland. Potential cargoes from these overlapping areas may have been taken into consideration in the forecast of more than one port. For this reason the overall forecast for all ports may be too ambitious.

Similarly comparisons can be made between the forecasts for the individual ports as prepared by Consultants and those as prepared by MSRTH in 2004.

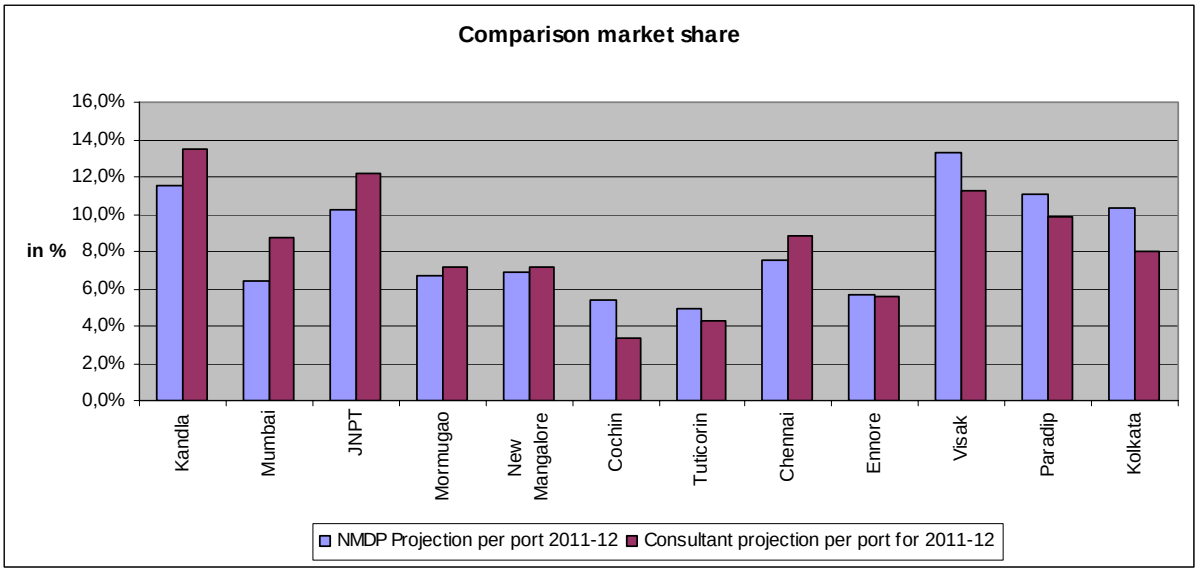

Figure 5.17 Comparison of forecasts per port for reference year 2011-12

From Figure 5.17 it can be seen that the forecasts of Consultants foresee higher throughputs for the northwest and west ports of India (Kandla to New Mangalore). The Consultants of the northeast ports are less optimistic with lower overall forecasts for Kolkata to Visakhapatnam. Consultants for Chennai are ambitious compared to NMDP, while the opposite is true for Cochin.

The following topics will be more specific with regards to ports.

5.8.1 Port of Kandla

The traffic projections for the Port of Kandla are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	49,05	61,47	118,60
Iron Ore	0,00	0,00	0,00
Coal	0,52	7,36	7,36
Fertilisers	4,13	4,51	6,15
Container Traffic	2,52	6,84	42,00
Other Cargo	14,41	17,95	30,40
Total Throughput	**70,63**	**98,13**	**204,51**
Container M TEU	0,21	0,57	3,50

Table 5.10 Cargo forecast Port of Kandla in M tons

The following observations can be made:

- Good opportunities to capture part of the market of North India (Delhi region);
- Severe competition from minor ports in Gujarat.

5.8.2 Port of Mumbai

The traffic projections for the Port of Mumbai are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	31,88	43,14	56,61
Iron Ore	0,00	0,00	0,00
Coal	2,86	4,79	5,84
Fertilisers	0,20	0,25	0,39
Container Traffic	2,64	8,16	30,00
Other Cargo	14,80	19,79	35,77
Total Throughput	**52,38**	**76,13**	**128,61**
Container M TEU	0,22	0,68	2,50

Table 5.11 Cargo forecast Port of Mumbai in M tons

Note: Consultant applied an average of 16 tons per TEU, which is exceptional. The world average is 12 tons per TEU, which has been used in this table.

The following observations can be made:

- Severe competition from minor ports in Gujarat;
- No synergy with Jawaharlal Nehru Port considered;
- Large base volume liquid bulk.

5.8.3 Jawaharlal Nehru Port

The traffic projections for the Jawaharlal Nehru Port are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	3,70	6,30	12,80
Iron Ore	0,00	0,00	0,00
Coal	0,00	0,00	0,00
Fertilisers	0,00	0,00	0,00
Container Traffic	45,24	81,00	290,52
Other Cargo	1,04	1,47	2,67
Total Throughput	**49,98**	**88,77**	**305,99**
Container M TEU	3,77	6,75	24,21

Table 5.12 Cargo forecast Jawaharlal Nehru Port in M tons

The following observations can be made:

- Favourable location for container terminal operations;
- No synergy with Port of Mumbai considered.

5.8.4 Port of Mormugao

The traffic projections for the Port of Mormugao are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	1,12	1,49	3,02
Iron Ore	37,72	39,02	50,47
Coal	6,70	7,40	14,43
Fertilisers	0,00	0,00	0,00
Container Traffic	0,16	0,23	0,61
Other Cargo	3,45	4,11	9,77
Total Throughput	**49,15**	**52,25**	**78,30**
Container M TEU	0,02	0,02	0,06

Table 5.13 Cargo forecast Port of Mormugao in M tons

The following observations can be made:

- Dependence on iron ore exports makes Port of Mormugao vulnerable;
- Uncertainty on policy GoI on iron ore exports;
- Conservative view on container forecast.

5.8.5 Port of New Mangalore

The traffic projections for the Port of New Mangalore are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	22,55	27,20	31,57
Iron Ore	7,30	10,20	20,09
Coal	1,00	4,30	7,00
Fertilisers	1,28	2,09	4,33
Container Traffic	0,47	1,25	3,83
Other Cargo	4,81	7,13	17,32
Total Throughput	**37,41**	**52,17**	**84,14**
Container M TEU	0,03	0,08	0,23

Table 5.14 Cargo forecast Port of New Mangalore in M tons

5.8.6 Port of Cochin

The traffic projections for the Port of Cochin are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	9,47	11,97	12,64
Iron Ore	0,00	0,00	0,00
Coal	0,26	0,84	0,36
Fertilisers	0,63	0,71	0,76
Container Traffic	3,84	6,00	29,16
Other Cargo	1,16	5,11	10,57
Total Throughput	**15,36**	**24,63**	**53,49**
Container M TEU	0,32	0,50	2,43

Table 5.15 Cargo forecast Port of Cochin in M tons

The following observations can be made:

- Uncertainty on policy GoI on cabotage.

5.8.7 Port of Tuticorin

The traffic projections for the Port of Tuticorin are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	0,80	0,90	1,40
Iron Ore	0,00	0,00	0,00
Coal	7,50	11,40	20,20
Fertilisers	1,50	1,70	2,50
Container Traffic	4,90	9,10	36,80
Other Cargo	6,50	7,70	10,90
Total Throughput	**21,20**	**30,80**	**71,80**
Container M TEU	0,46	0,84	3,08

Table 5.16 Cargo forecast Port of Tuticorin in M tons

5.8.8 Port of Chennai

The traffic projections for the Port of Chennai are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	14,01	15,00	20,00
Iron Ore	10,66	11,09	0,00
Coal	1,43	1,43	0,00
Fertilisers	0,00	0,00	0,00
Container Traffic	15,84	27,68	57,64
Other Cargo	12,81	8,97	9,47
Total Throughput	**54,75**	**64,17**	**87,11**
Container M TEU	1,32	2,31	4,80

Table 5.17 Cargo forecast Port of Chennai in M tons

Note: Forecast for POL – Product & Crude is excluded imports via pipeline
**An average of 16 tons per TEU has been taken, which is exceptional. The world average is 12 tons per TEU.*

The following observations can be made:

- Major decision to abandon the handling of dirty bulk cargoes (coal and iron ore) goods from the port;
- No synergy with Port of Ennore considered;
- Optimism with regard to competitive position regarding container handling market.

5.8.9 Port of Ennore

The traffic projections for the Port of Ennore are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	0,00	0,00	0,00
Iron Ore	2,00	7,90	12,00
Coal	9,00	25,80	35,30
Fertilisers	0,00	0,00	0,00
Container Traffic	0,00	5,40	86,76
Other Cargo	0,30	1,54	2,34
Total Throughput	**11,30**	**40,64**	**136,40**
Container M TEU		0,45	7,23

Table 5.18 Cargo forecast Port of Ennore in M tons

The following observations can be made:

- No synergy with Port of Chennai is considered;

- Uncertainty on policy GoI on iron ore exports.

5.8.10 Port of Visakhapatnam

The traffic projections for the Port of Visakhapatnam are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	12,80	19,10	23,70
Iron Ore	17,50	20,00	29,50
Coal	12,70	16,20	26,40
Fertilisers	3,90	5,20	9,20
Container Traffic	1,30	3,50	13,80
Other Cargo	9,50	17,70	44,20
Total Throughput	**57,70**	**81,70**	**146,80**
Container M TEU	0,11	0,29	1,15

Table 5.19 Cargo forecast Port of Visakhapatnam in M tons

The following observations can be made:

- Thermal coal forecast heavily affected by competition of Port of Paradip;
- Uncertainty on policy GoI on iron ore exports;
- Forecast considerations include competition with west coast ports for North India container market;
- Competition foreseen for bulk market from Port of Gangavaram.

5.8.11 Port of Paradip

The traffic projections for the Port of Paradip are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	5,30	17,60	33,70
Iron Ore	12,80	16,10	22,80
Coal	20,50	27,70	47,80
Fertilisers	3,70	5,30	7,80
Container Traffic	0,08	0,25	3,50
Other Cargo	3,20	4,60	10,00
Total Throughput	**45,60**	**71,55**	**125,60**
Container M TEU	0,07	0,02	0,29

Table 5.20 Cargo forecast Port of Paradip in M tons

The following observations can be made:

- Thermal coal forecast affected by competition from Port of Visakhapatnam;
- Uncertainty on policy GoI on iron ore exports;
- Forecast considerations include competition with west coast ports for North India container market.

5.8.12 Port of Kolkata

The traffic projections for the Port of Kolkata are presented in the table below:

	2007-08	2011-12	2025-26
POL – Product & Crude	9,98	12,34	21,91
Iron Ore	7,66	4,66	4,66
Coal	12,02	19,46	24,92
Fertilisers	0,00	0,00	6,07
Container Traffic	6,89	11,97	85,35
Other Cargo	8,46	10,04	29,41
Total Throughput	**45,01**	**58,47**	**172,32**
Container M TEU	0,57	1,00	7,11

Table 5.21 Cargo forecast Port of Kolkata in M tons

The following observations can be made:

- Long term forecast for Kolkata heavily affected by potential deepsea hub development and by development of Kulpi Port;
- No synergy between Saugor/Haldia and Kolkata Docks considered.

6 Port facilities

6.1 General

In order to realise the potential forecast, port and terminal facilities are required. In case the capacities of existing facilities are not sufficient, these need to be restructured, improved, overhauled or extended. The construction of complete new facilities is another option to increase the port and terminal capacity. The Final Reports include many projects to boost the capacity of existing facilities and to construct new facilities.

The following port and terminal requirements can be distinguished:

- Basic port infrastructure; port area, access channel, breakwaters;
- Quay walls, jetties;
- Ship to shore equipment; loaders, unloaders, quay cranes;
- Open and covered storage areas;
- Yard equipment; stackers, reclaimers, Rubber Tyred Gantries, reach stackers, lift trucks;
- Rail terminal;
- Truck interface and gate facilities;
- Connections to road and rail networks.

6.2 Terminal capacity

Though benchmarks do exist, the translation from forecast to terminal requirements is not a straightforward calculation. Many factors play a role in such a translation exercise. For defining the required ship-to-shore capacity not only the expected volume however also the following parameters play a role for example:

- Vessel characteristics; fleet mix, vessel sizes, call sizes;
- Cargo characteristics; unit weight of unitised cargoes, density of bulk cargoes;
- Crane productivity often expressed in tons/hr or containers/hr;
- Working times; number of shifts a day, working time per shift excluding time lost due to shift changes, mealbreaks, etc, number of working days per week; down times due to for example adverse weather conditions or equipment breakdowns;
- Acceptable Berth Occupancy Factor (BOF).

6.3 Berth Occupancy Factor (BOF)

The berth occupancy factor is the time that the berth is utilised divided by the total available time. The combining of physically distinct groups of berths into one berthing plan for the stream of traffic results in more flexibility and in a reduction in ship waiting time. The greater risk of queuing when groups of berths are treated independently arises as a result of the possibility of a ship having to queue for a berth in one group at a time when there is actually a vacant berth in another group.

UNCTAD in the manual “Port Development” presents figures for recommended maximum berth occupancy factors as per
Table 6.1 for conventional general cargo operations. UNCTAD states that these figures are based on a ratio of ship cost to berth cost of 4 to 1.

Number of berths	Max BOF
1	40%
2	50%
3	55%
4	60%
5	65%
6 – 10	70%

Table 6.1 UNCTAD guidelines for BOF for conventional general cargoes

With respect to the BOF the Consultants in general applied standards listed in one of the Consultants reports as being common for Indian ports and as indicated in Table 6.2.

	Max BOF
Dedicated berths	
One berth	60%
More than one berth	70%
Common berths	
Up to 3 berths	70%
More than 3 berths	75%

Table 6.2 Reported guidelines for BOF for Major Ports India

6.4 Benchmarks

The mix of parameters including the BOF as adopted by the Consultants result in the benchmarks for quay capacity:

Table 6.3 Benchmarks container quay capacity resulting from analysis of Consultants (TEU/m/yr)

	present	projected
JNPT	2.000	2.400
Mumbai		1.200
Cochin	1.400	1.700
Tuticorin	1.200	1.500
Chennai	900	1.350
Ennore	1.200	1.500
Kandla		2.250

Table 6.3 Benchmarks container quay capacity resulting from analysis of Consultants (TEU/m/yr)

These benchmarks were used by Consultants to define the ship-to-shore capacity of container terminals in the Indian Major Ports or are the result of calculations from the reverse calculations when capacities and quay length were provided by Consultants.

Comparable benchmarks for international ports have been provided by various Consultants. Reference is made to the table below.

	present
Hongkong	2.050
Singapore	1.920
West Europe	1.950

Table 6.4 benchmarks container quay capacity (TEU/m/yr)

Productivity figures for general cargoes are subject to large deviations in view of various conditions (type of cargo, equipment size, vessel size, etc). In spite of this, indicative benchmarks have been provided by various Consultants.

	present
Australia	4.500 – 9.000
Visakhapatnam	4,000
Paradip	2.500 – 4.000

Table 6.5 benchmarks productivity iron ore loading ports (tons/hour/loading unit)

Type of vessel (dwt)	present
200.000 dwt	12.000
100.000 dwt	7,000
50.000 dwt	4.500
25.000 dwt	3.500

Table 6.6 benchmarks pump capacity crude oil (m3/hour)

For further information reference is made to Annexure 4 of this report.

7 Port planning

7.1 General

In the process to prepare the Business Plans for the 12 Major Ports, the Consultants translated the port and terminal requirements into short term and long term projects. In most cases a Masterplan was defined indicating the long term overall planning of the port. Based on the forecast for the short term (period from 2007 to 2013) the short term projects were defined under the condition that the short term projects fit well in the Masterplan for the long term.

The entire list of projects defined for the 12 Major Ports and proposed by Consultants is enclosed in Volume II. In this Chapter the main proposed projects have been listed per port. For the lay outs of the ports and the project locations reference is made to the Figure 7.1 to
Figure 7.23. Observations of the Advisor per port have been included.

7.2 Port of Kandla

7.2.1 Proposed projects

- Container Terminal 1 (restructuring of berths 11 and 12);
- Container Terminals 2 and 3 (restructuring berths 7 to 10);
- Multi cargo berths 13 to 16;
- Expansion of the existing liquid bulk cargo jetty;
- Deepening of the access channel (Kandla Creek);
- Coal and multi cargo berths at Tuna;
- Crude oil import facilities at Vadinar;
- Road and Rail connectivity projects and programmes.

7.2.2 Kandla Port layout

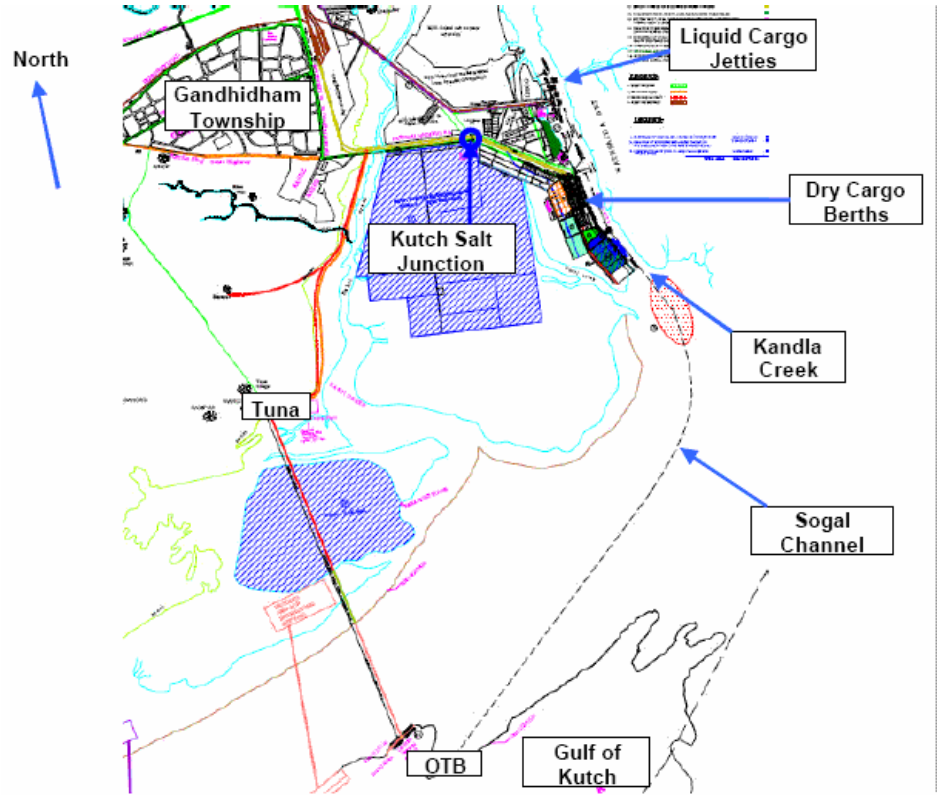

Figure 7.1 Present layout Port of Kandla

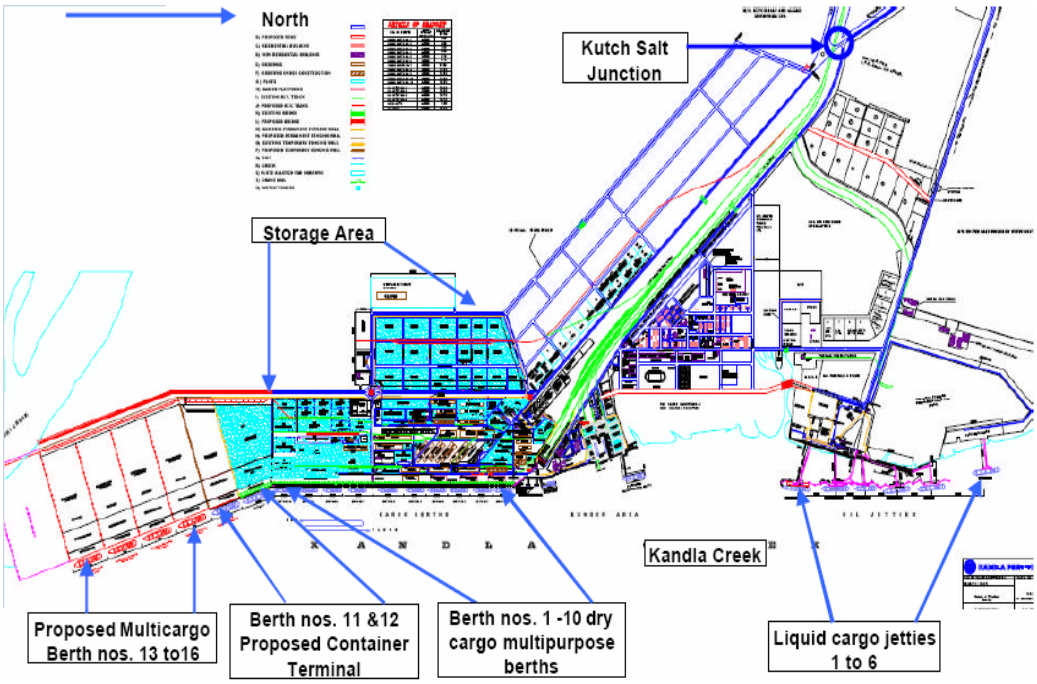

Figure 7.2 Future layout Port of Kandla

7.2.3 Main observations

- The ultimate capacity of the port is restricted by the nautical capacity of the access channel (Kandla Creek);
- Expansion possibilities are available at Tuna and Vadinar (sea side of Kandla Creek);
- Estimates on the capacity of container terminals are optimistic as a result of relative high adopted benchmarks.

7.3 Port of Mumbai

7.3.1 Proposed projects

- Offshore Container Terminals 1 and 2;
- CFS's, off-dock Container Yards and Empty Depots;
- 5th oil Berth at Butcher Island;
- Cruise Terminal;
- Second Chemical Terminal;
- Road and Rail connectivity projects and programmes of main importance.

7.3.2 Mumbai Port layout

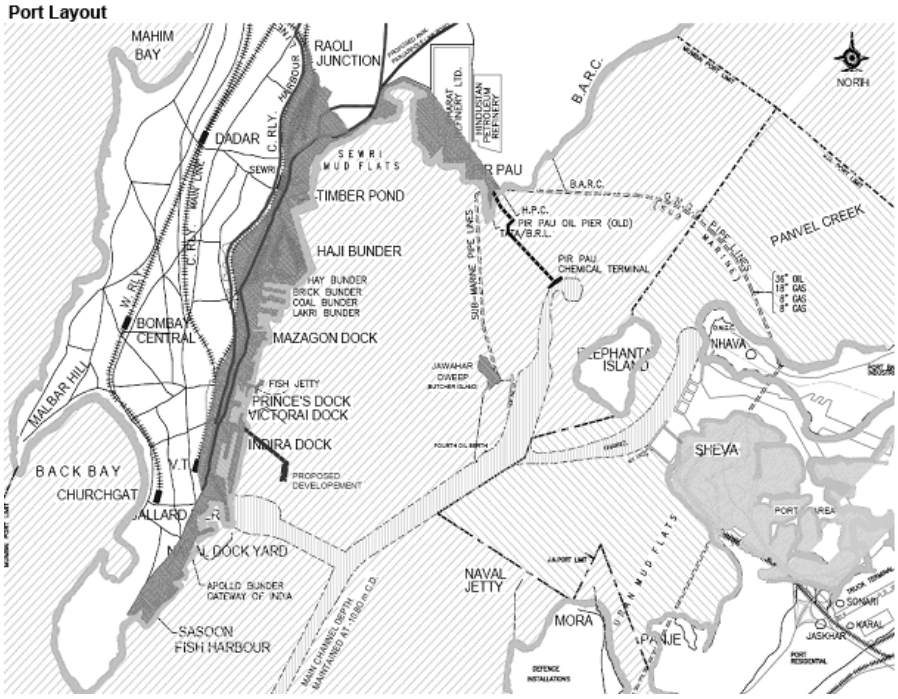

Figure 7.3 Layout Port of Mumbai

7.3.3 Main observations

- The capacity of the port is restricted by the surrounding urban area and the resulting problems related to hinterland connectivity;
- The planned container operations at OCT include long horizontal transport haulage;
- Consultant did not foresee plans on a transfer of port area to urban area.

7.4 Jawaharlal Nehru Port

7.4.1 Proposed projects

- Completion of Container Terminal GTI;
- Expansion berth towards NSICT;
- Container Terminal 4;
- Marine Chemical Terminal;
- Second Chemical Terminal;
- Road, Rail and pipeline connectivity projects and programmes.

7.4.2 Jawaharlal Nehru Port layout

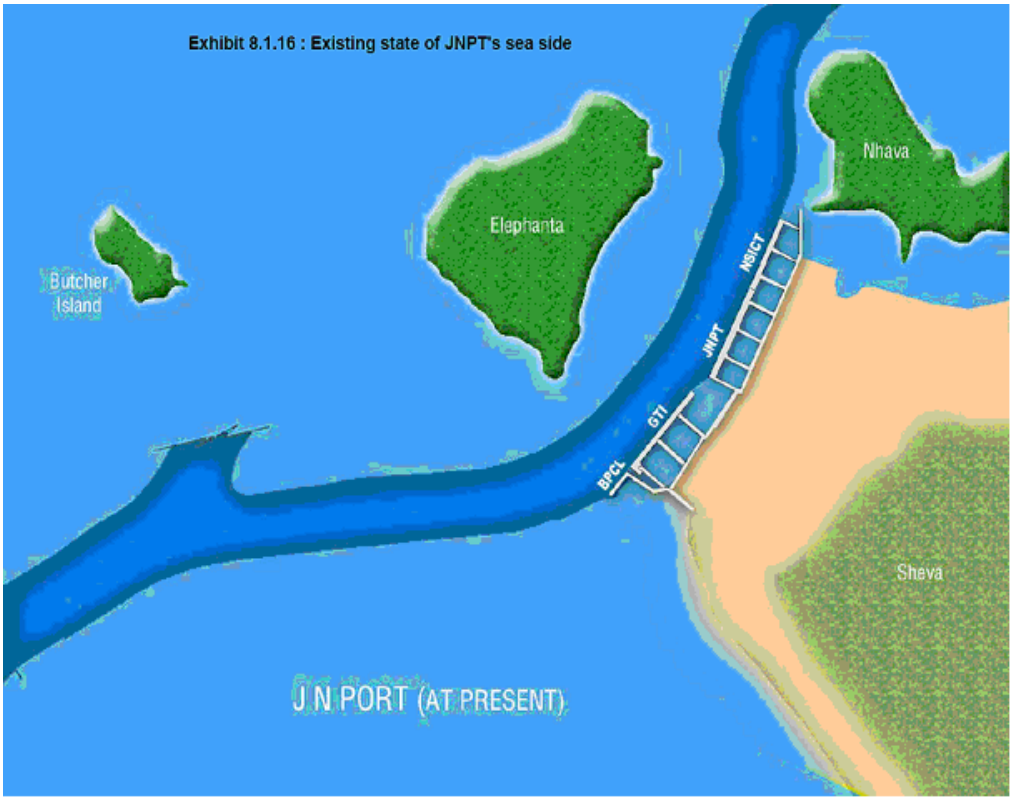

Figure 7.4 Present layout Jawaharlal Nehru Port

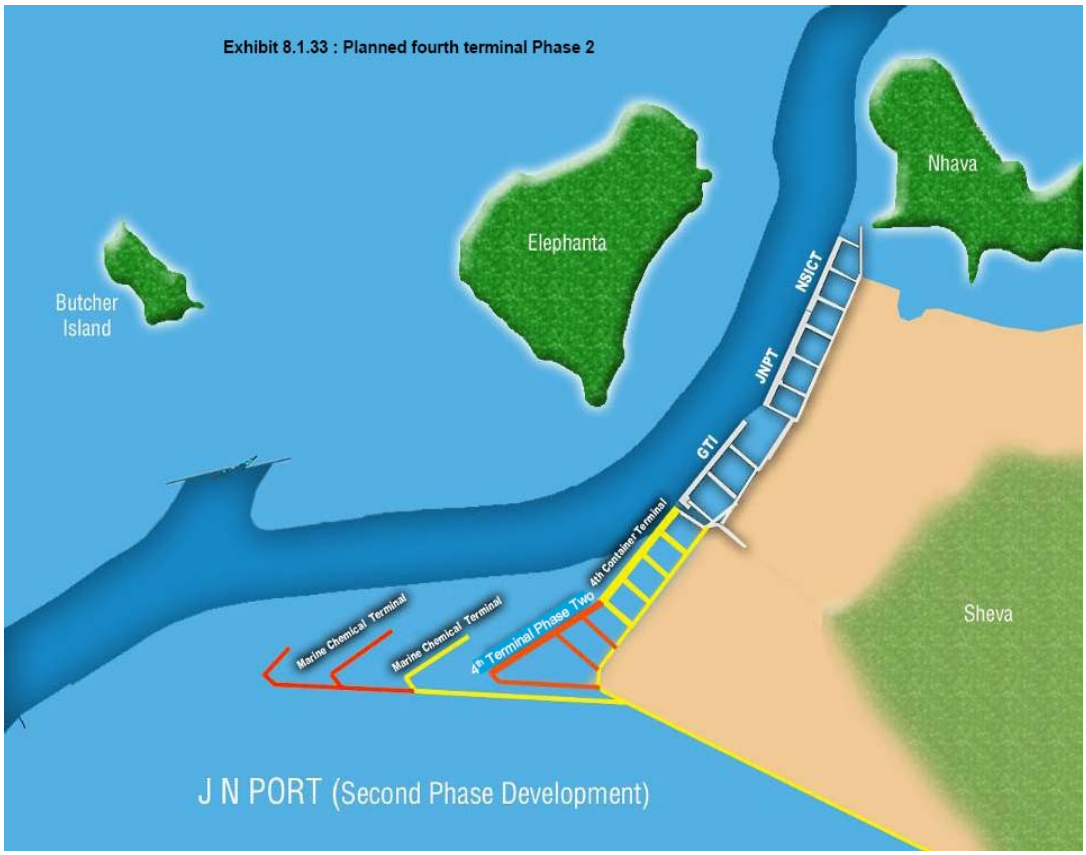

Figure 7.5 Future layout Jawaharlal Nehru Port

7.4.3 Main observations

- Mid and long term container terminal requirements have not been considered sufficiently;
- Estimates on capacity of container terminals are optimistic as a result of adopted relative high productivity benchmarks;
- Increased application of the door-to-door concept for container transport has not been considered.

7.5 Port of Mormugao

7.5.1 Proposed projects

- Integration of berth 8 and 9 for iron ore handling;
- Introduction railway wagon tippler for iron ore transfer;
- Additional iron ore storage capacity;
- Additional mooring dolphins;
- Mobile crane for general cargo berth 11;
- New coal berth;
- Liquid bulk berths;
- Cruise vessel berth
- Port craft jetty.

7.5.2 Mormugao Port layout

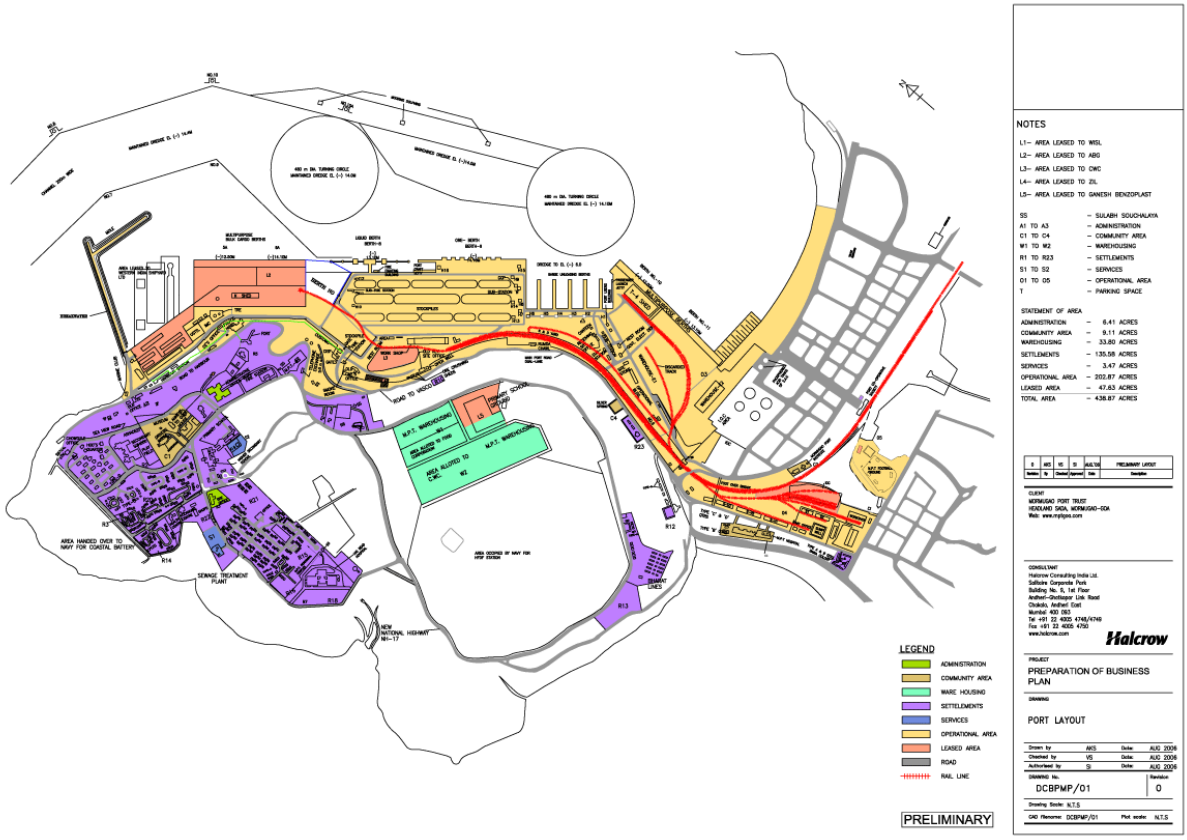

Figure 7.6 Present layout Port of Mormugao

Figure 7.7 Possible alternative Masterplan for the Port of Mormugao

Figure 7.8 Future layout extension Port of Mormugao (2014)

Figure 7.9 Future layout extension Port of Mormugao (2025)

7.5.3 Main observations

- Storage capacity iron ore and large number of (small) traders are constraints for iron ore throughput;
- Medium and long term development is difficult in the limited existing port area;
- Heavy social impacts are related to port developments in Vasco Bay and Baina Bay.

7.6 Port of New Mangalore

7.6.1 Proposed projects

- Mechanisation of the new iron ore berth 14;
- Berth 15 of new Western Dock for handling coal;
- Restructuring of berth 1 and 2 for container handling;
- Construction/conversion of berth 13 for handling liquid bulk;
- Deepening of channel and turning basin;
- Marshalling yard near new Western Dock;
- Development of SBM facilities for crude oil imports;
- LNG Terminal;
- Container terminal in Western Dock;
- National road and railway connectivity plans.

7.6.2 New Mangalore Port layout

Figure 7.10 Present layout Port of New Mangalore

Figure 7.11 Future layout Port of New Mangalore

7.6.3 Main observations

- No expansion of iron ore handling and storage capacity possible at berth 14 after present capacity is reached in 2013;
- Proposed container handling capacity does not indicate great ambition.

7.7 Port of Cochin

7.7.1 Proposed projects

- Development of SBM facilities for crude oil imports;
- LNG and LPG Terminals;
- Bunkering Terminal;
- Vallarpadam Container Terminal;
- Cruise Terminal;
- Upgrading Willingdon Island;
- National road and railway connectivity plans.

7.7.2 Cochin Port layout

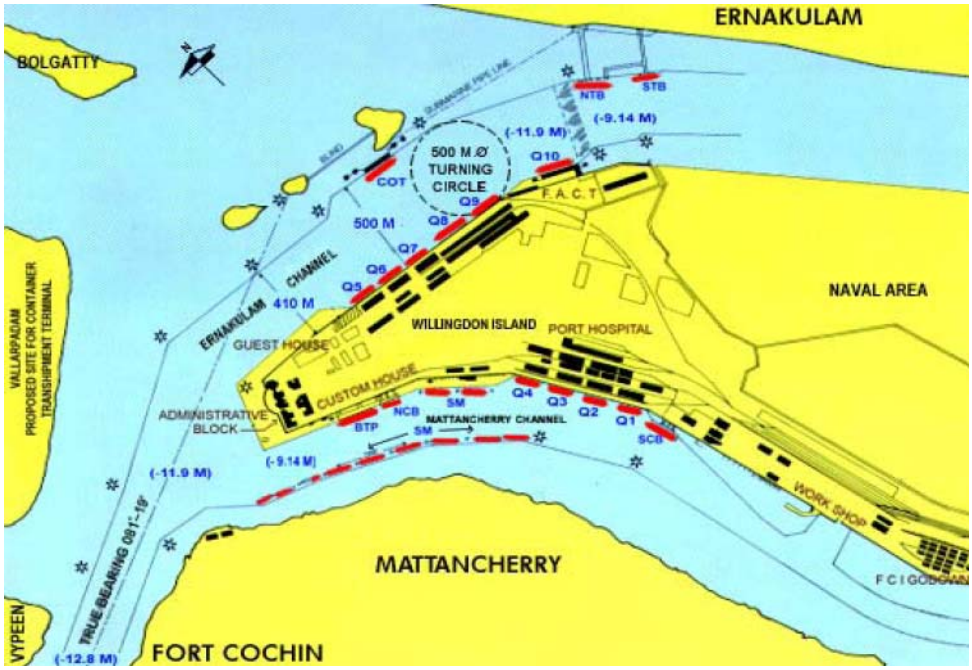

Figure 7.12 Present layout Port of Cochin

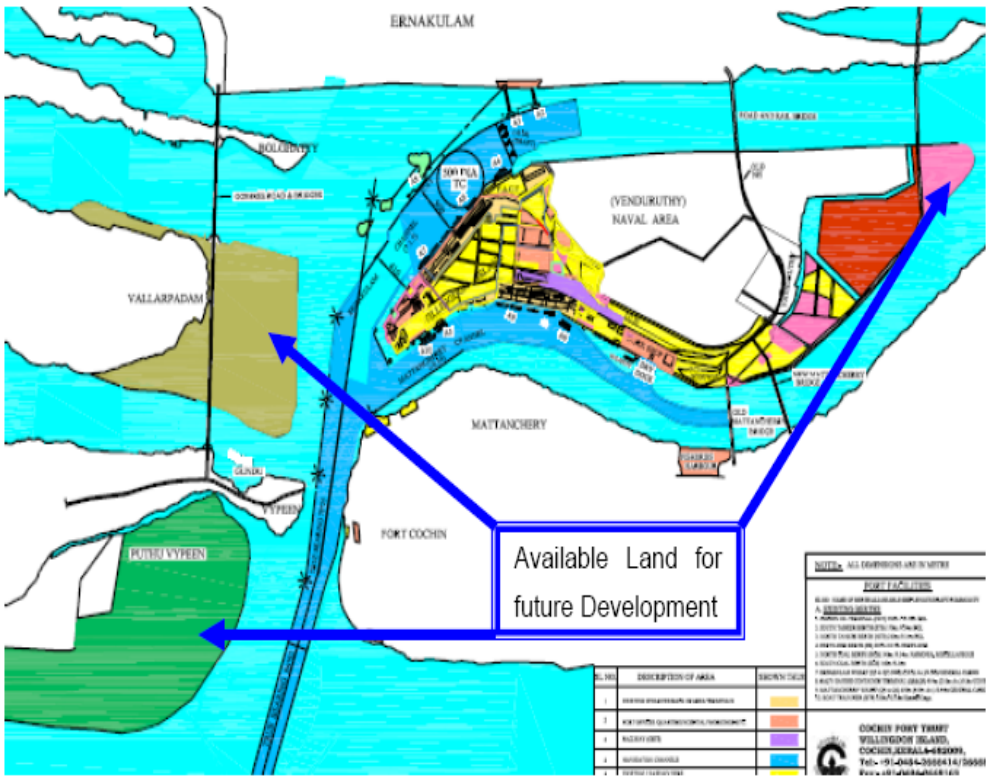

Figure 7.13 Future layout Port of Cochin

7.7.3 Main observations

- Future function of Cochin Oil Terminal (COT) is not clear with the planned development of the SBM for the import of crude oil;
- Interesting Railway “backbone” concept for south India;
- State border problems are being encountered with regard to hinterland transport via road modality.

7.8 Port of Tuticorin

7.8.1 Proposed projects

- Deepening of existing channel and harbour basin;
- Development of outer harbour;
- Onversion of berth 8 into Container Terminal;
- North Cargo Berth for thermal coal handling.

7.8.2 Tuticorin Port layout

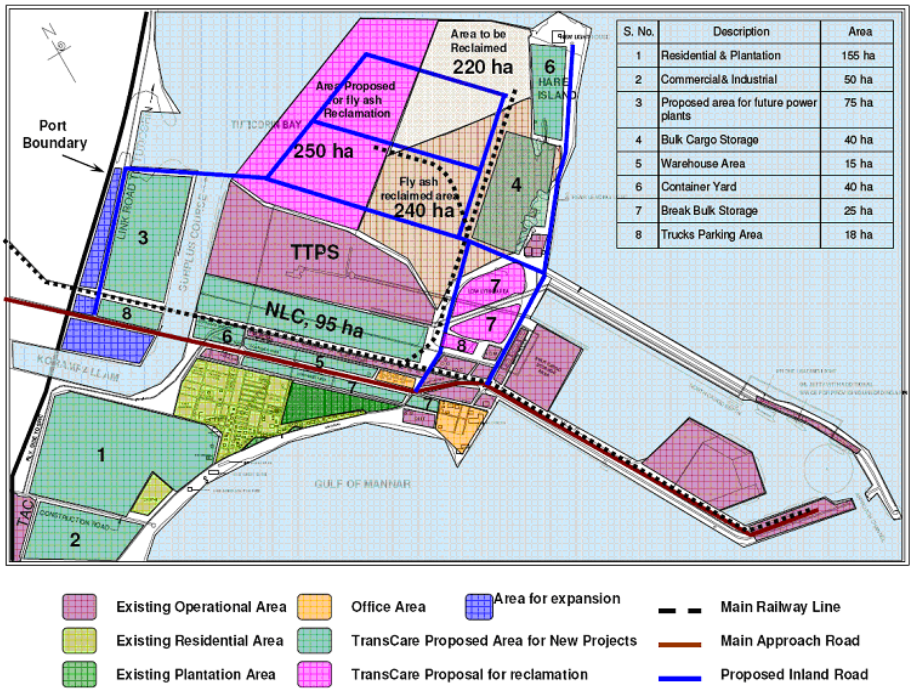

Figure 7.14 Future layout Port of Tuticorin

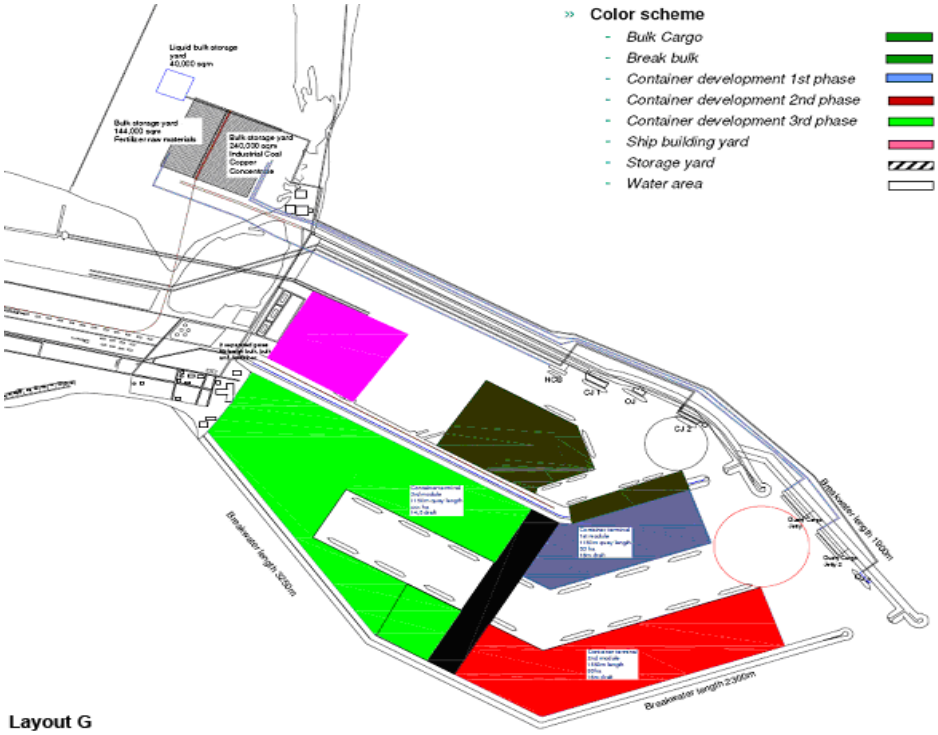

Figure 7.15 Masterplan Port of Tuticorin

7.8.3 Main observations

- Outer harbour developments requires long and expensive breakwaters;
- Terminal development is focussed on expansion container handling facilities;
- Interesting Railway “backbone” concept for South India;
- Feasibility of application of fly ash for land reclamation needs to be investigated;
- Impact of outer harbour on tidal currents needs to be investigated.

7.9 Port of Chennai

7.9.1 Proposed projects

- Development of Container Terminals 2, 3, 4 and 5;
- Off-dock facility Tondiarpet;
- Ennore – Manali Road;
- Elevated Expressway to Poonamallee;
- Railway Terminal at Tondiarpet and shuttle train connection between Port and Railway Terminal;
- Cruise Terminal;
- Car Terminal and car parking facility.

7.9.2 Chennai Port layout

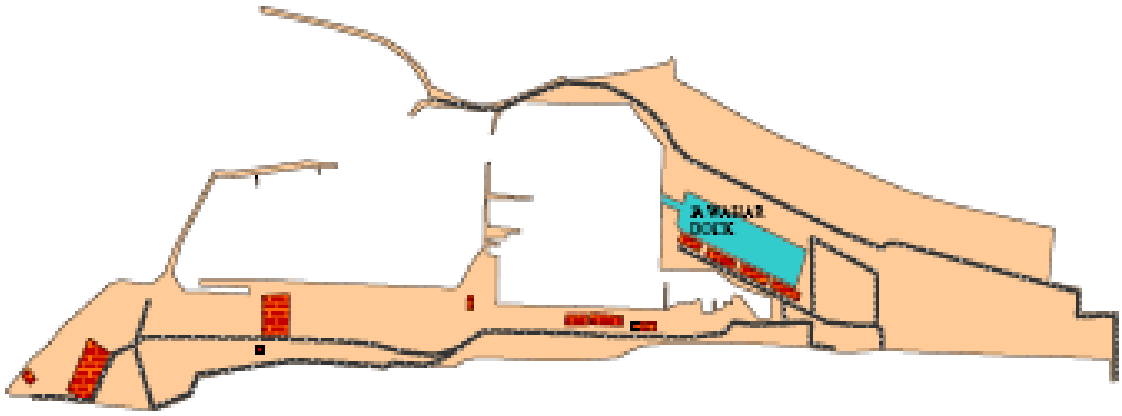

Figure 7.16 Present layout Port of Chennai

7.9.3 Main observations

- Good maps are provided of the future lay out, but could not be copied into this document. Reference is made to the Final Business Plan;
- Stacking areas are limited;
- Off-dock solutions for stacking result in double handling and are therefore expensive;
- National and state road and railway connectivity plans of prime importance.

7.10 Port of Ennore

7.10.1 Proposed projects

- Upgrading existing Coal berths for handling thermal coal;
- Common User Coal Terminal;
- Marine Liquid Terminal;
- Container Terminal;
- Dredging and reclamation works;
- National and state road and railway connectivity plans.

7.10.2 Ennore Port layout

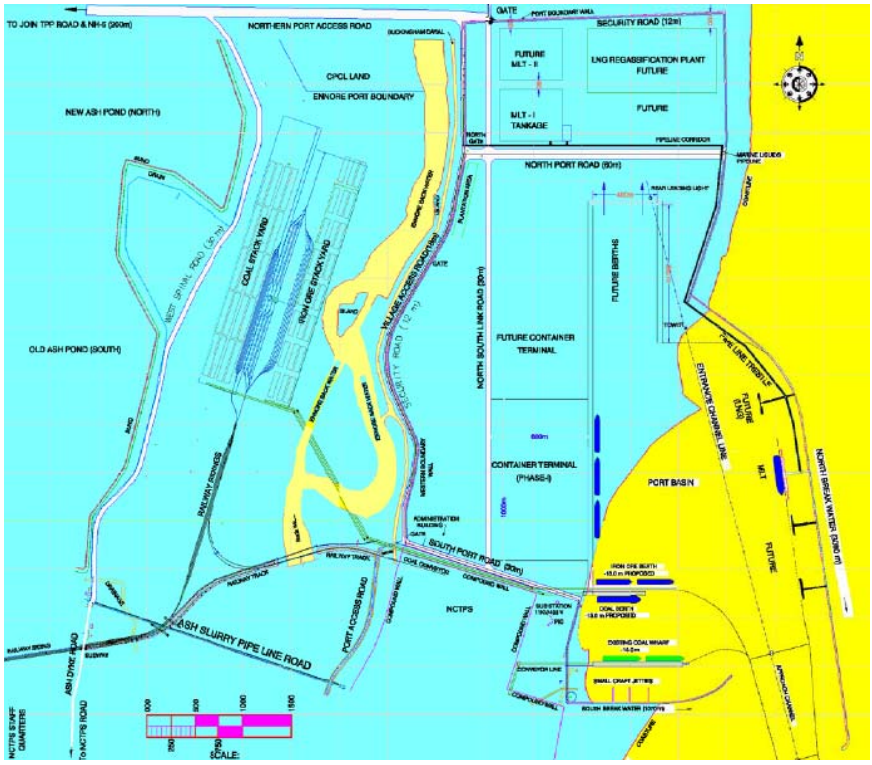

Figure 7.17 Future layout Port of Ennore

7.10.3 Main observations

- Major expansion possibilities;
- Masterplan for long term is missing (pipeline, creek).

7.11 Port of Visakhapatnam

7.11.1 Proposed projects

Inner harbour

- Export facility for bulk cargoes at West Quay 1 and 2;
- Reorganisation of fertiliser handling at East Quay;
- East Dock and strengthening East Quays;
- Deepening entrance channel to inner basin.

Outer harbour

- Mechanisation General Cargo Berth;
- Upgrading iron ore jetty;
- Handling facility for crude oil and POL (SBM);
- Extension Container Terminal.

7.11.2 Visakhapatnam Port layout

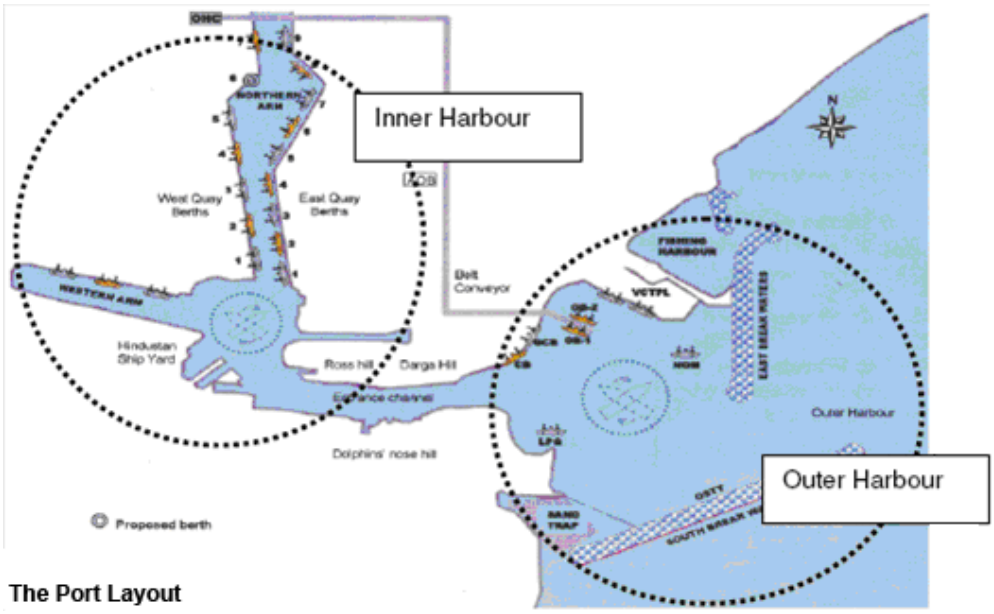

Figure 7.18 Present layout Port of Visakhapatnam

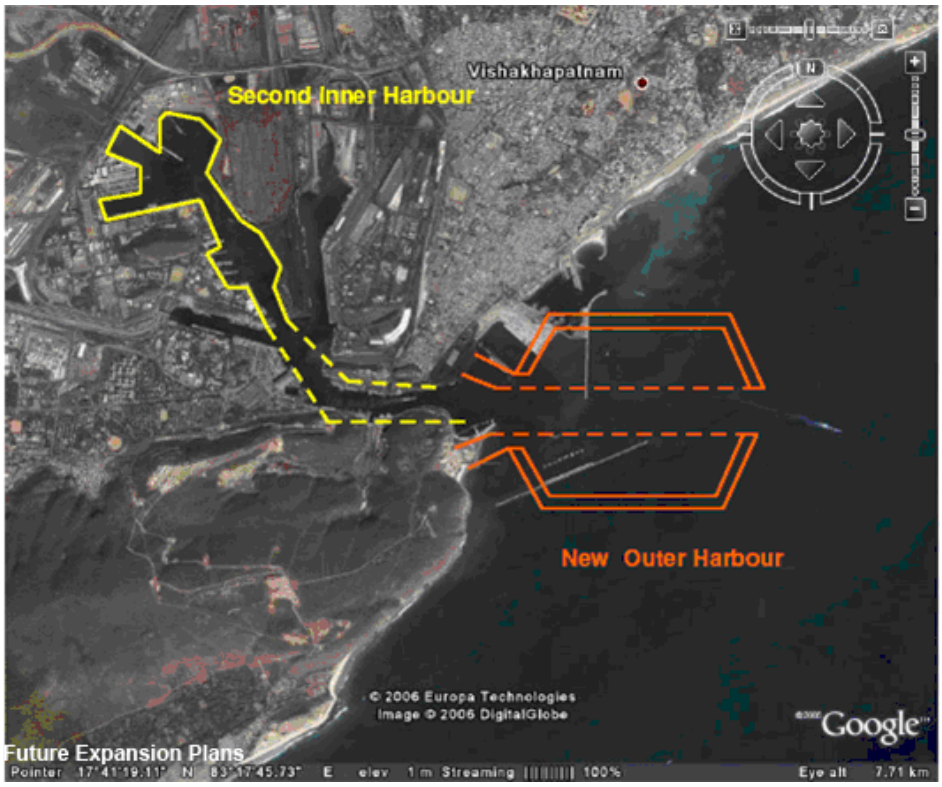

Figure 7.19 Future layout Port of Visakhapatnam

7.11.3 Main observations

- Extension of inner harbour has been selected by Consultant as long term port development in spite of presence of Navy facilities in the area.

7.12 Port of Paradip

7.12.1 Proposed projects

- Deepening of entrance channel;
- Extension of breakwater;
- Iron ore and coal mechanised terminals;
- Container Terminal;
- Fertiliser Terminal.

7.12.2 Paradip Port layout

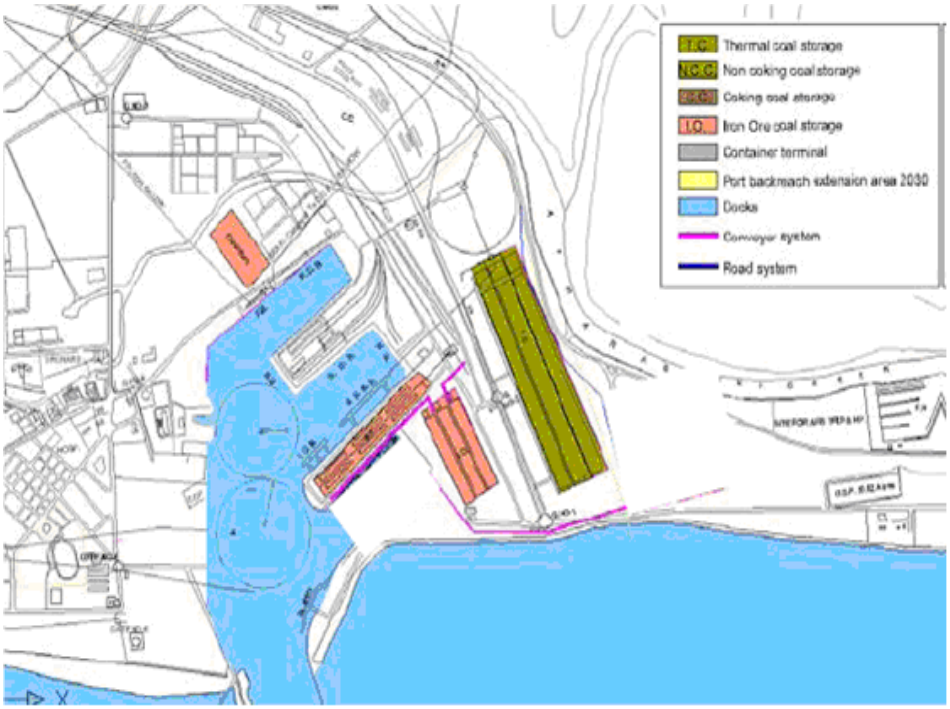

Figure 7.20 Present layout Port of Paradip

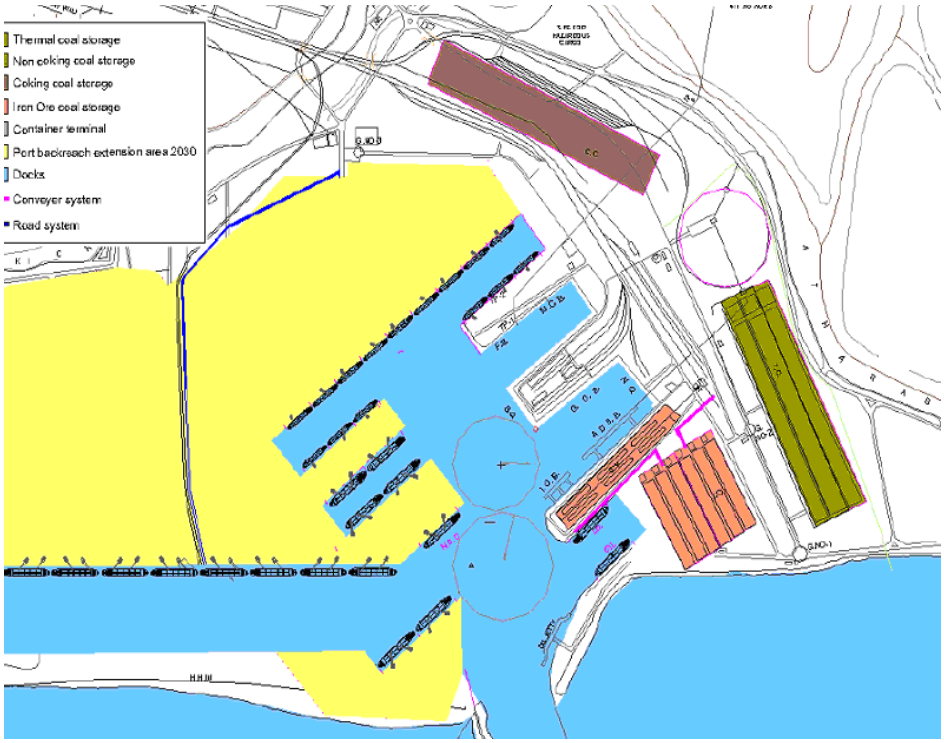

Figure 7.21 Future layout Port of Paradip (one of Masterplan options)

7.12.3 Main observations

- Positive development of railway transport through dedicated railway line between mines and port;
- Various long term port development plans (Masterplans) proposed.

7.13 Port of Kolkata

7.13.1 Proposed projects

- Two riverine multipurpose jetties near Haldia Dock Complex;
- Three riverine multipurpose jetties at Diamond Harbour;
- Three riverine multipurpose jetties at Saugor.

7.13.2 Kolkata Port layout

Figure 7.22 Present layout Port of Kolkata (NSD)

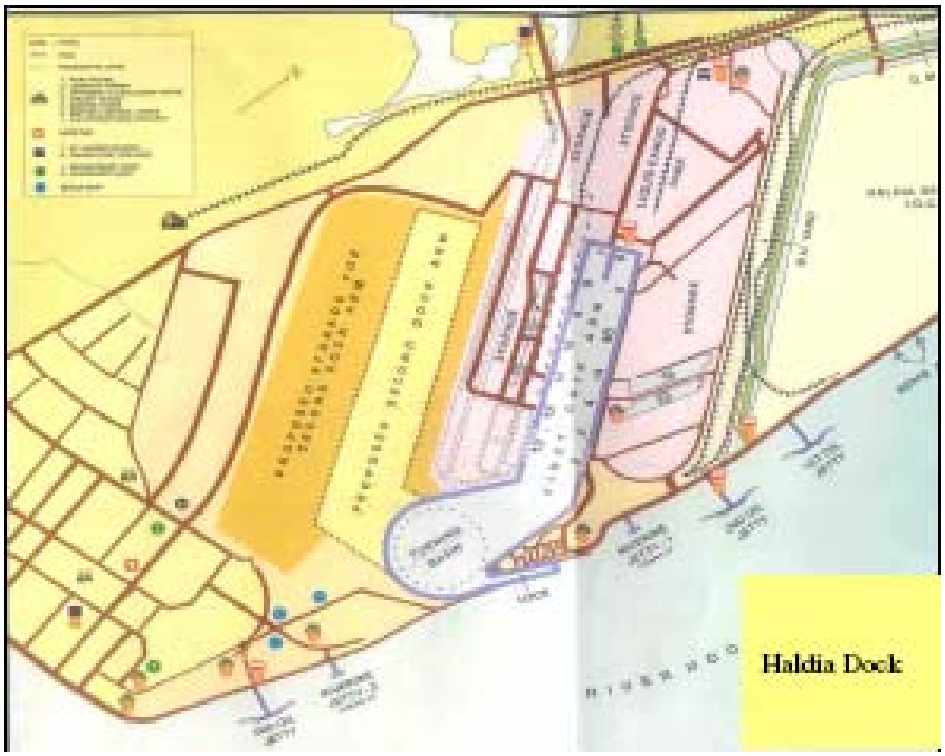

Figure 7.23 Present layout Port of Kolkata (Haldia)

7.13.3 Main observations

- No expansion of Haldia Dock foreseen in spite of demand for capacity increase;
- No proposals indicated on development of Kidderpore Docks (deepsea, IWT or urban area);
- National and state road and railway connectivity plans.

8 Hinterland connectivity

8.1 General

As in many other countries, probably the most important transport/logistics challenge facing India is its infrastructure. While considerable private sector investment is now being directed into the development, expansion and modernisation of Indian ports, the country's road, rail and inland waterway systems have suffered from years of neglect and under-investment.

The average cost of freight is relatively high and India's inadequate transport infrastructure is holding back economic growth according to Drewry.

The system of distribution containers and containerised cargoes is highly concentrated with most containers for Delhi and north India being routed through the Mumbai/JNPT port complex. This route is already one of the busiest domestic freight arteries in the country. With new container terminal developments in Gujarat and with decent rail connections to and from the ports of Mundra and Pipapav this situation is changing gradually.

8.2 Highways

The Indian highway network is limited and many of the roads are in poor condition. A World Bank Report (India's Transport Sector – 2002) identified in 2002 only some 2% of the national highway system as being 4 lanes with the remaining 98% being double, single or intermediate. In the regional network, no state highways were 4 lanes and only 23% comprised 2 lanes. The backlog of years of under-maintenance is huge. The same report listed that 25% of state and national highways are congested.

In the latter years capital expenditure on roads has been increasing amongst others for improvements to the national highway system.

The regulatory environment and the reliance on regional/provincial operating agreements and licences has resulted in a very fragmented road haulage industry characterised by the presence of many small companies employing just a few trucks and by a shortage of modern specialised freight transport equipment.

A number of schemes targeted at improving connections between main ports and the national highway network are either underway or in a planning stage. The majority of these projects are being realised through Special Purpose Vehicles (SPV's) set up between various (government) agencies.

In this respect JNPT formed an SPV with NHAI (National Highway Authority of India) and CIDCO (City and Industrial Development Corporation of Maharashtra Ltd).

To improve road connectivity at Chennai, the Port Trust formed an SPV with NHAI and the government of Tamil Nadu – Chennai Ennore Port Road Company Ltd.

One of the largest and most ambitious projects being implemented is the Golden Quadrangle and North-South and East-West Corridors project, which is being administered by the NHAI. The project involves the construction of four-lane road links between the four main cities of India (Delhi, Mumbai, Chennai and Kolkata) with a view to improve speed and raise safety and security standards for passengers and cargo.

8.3 Railways

Indian Railways is a vast network. The importance of rail to the Indian transport market is obvious. Good rail connectivity is essential as large volumes of cargoes move to and from the port hinterlands.

Currently Mumbai port complex is one of the main rail cargo transfer centres in India. Congestion is experienced in the region due to lack of track capacity, shortage of rail cars and capacity limitations in rail cargo depots. Ocean carriers for this reason have been looking for alternative port gateways in the Northwest part of India as Mundra, Hazira and Pipapav in Gujarat.

Another disadvantage of the railway system is the multi gauge character which often does not support through transport and seamless services and the relative high cost. Some progress is made in conversion of narrow gauge track to broad gauge, however progress is slow.

The provision of rail services is being liberalised with the Indian Government ending the monopoly of Concor on moving containers by rail.

In 2004-05 rail transport figures indicated that 30% of India's international container traffic was moved by rail.

8.4 Inland waterways

India's navigable inland waterways comprise almost 14.500 km, of which 5.200 km of major rivers and some 500 km of canals are suitable for mechanised craft. Inland waterway transport (IWT) is limited to only 1% of total inland cargo transport.

A structural development of a IWT system/network could help to remove substantial volumes of bulk cargo from the road and rail networks.

The application of the IWT mode has been analysed and described by the Consultants for the ports of Mormugao and Cochin. Iron ore is transported in large volumes from the jetties near the mines and from consolidation points along the river Zurai to Mormugao with inland barges to the iron ore loading facilities at Mormugao and Panjim. At Mormugao the barge unloading facility has been described as well. Fertiliser Raw Material is shipped with inland barges via the backwater system to a fertiliser plant along the waterway.
The IWT system in the northeast along Hooghly, Ganga and Bhramaputra from Kolkata to as far as the northern states (e.g. Assam) has been described. No present or potential cargo volumes related to IWT have been included for Kolkata though.

8.5 Coastal transport and transhipment

In order to enable the Indian ports to develop a significant hub role, more than capacity and efficiency is required. The present regulations stipulate that coastal shipments, whether international feeder or pure domestic cabotage, need to be undertaken under Indian flag vessels. International carriers cannot be involved in the coastal transport and are therefore not attracted to use Indian ports as centres for their transhipment services.

Similar to IWT, a strong development of coastal transport could relax the burden on the landside infrastructure since the country's geography would naturally promote North South coastal shipping and feeding international traffic.

9 Port organisation

9.1 Port organisation

The Consultants have all examined the situation with respect to the internal organisation of the Port Trusts and recommended many projects for improvements. Most projects related to:

- (The establishment of) the Human Resources Department;
- (The establishment of) the Marketing Department;
- The improvement of the Information Technology structure.

Reference is made to Volume II and in particular to the Business Plans of the ports. The character of the recommendations made coincide with the general problems encountered in public service ports. Port marketing and user responsiveness for example, are often considered to be unnecessary for a public port, which is there to serve all users.

In the following sections the port management models will be explained and suggestions for changes will be presented.

9.2 Port management models

In a port there are many functions to be performed:

- Landlord function;
- Regulatory function;
- Planning function;
- Nautical function;
- Port marketing and promotion function;
- Cargo handling function;
- General functions.

The way in which these functions are divided between the parties active in a port, determines the port management model. The distinction between the three types of port management models as outlined in the table below, is mainly determined by:

- The ownership of the infrastructure, including all wet and dry areas in the port, including the quay walls;
- The ownership of the superstructure (in particular ship/shore handling equipment), including pavement, all buildings, constructions and equipment;
- Employment of stevedoring labour (in particular on board the ship), the workforce required for the (un)loading of the vessels.

Type	Infrastructure	Superstructure	Stevedoring / labour	Other functions
Landlord port (Rotterdam)	Public	Private	Private	Public/Private
Tool port	Public	Public	Private	Public/Private
Public service port	Public	Public	Public	Majority public
Private service port	Private	Private	Private	Majority private

Figure 9.1 Port Management Models

The Major Ports in India are public service ports with private elements within, such as the BOT operators active in these ports. From the Business Plans of the 12 Major Ports there is a clear intention to shift towards the landlord port management model.

This would lead to the following situation:

- The core activities of the Port Trust would be reduced to: provision of infrastructure, responsibility of nautical safety and environment, strategic long term port planning;
- The infrastructure of the port would remain in public hands, but would then be leased out to private operators on the basis of long term contracts;
- These private operators would be responsible for investments in superstructure and maintenance. They would provide offices, sheds, warehouses, CFS's, workshops, cranes, equipment, conveyor belts etc, following the core activities of the company concerned;
- The private operators would also employ their own stevedoring labour;
- All other activities related to the handling of vessels and cargo would also become the responsibility of private companies. To this category belong activities such as bunkering, mooring and unmooring, pilotage, towage, shipping agency.

Obviously a shift to another port management model, in this case the landlord type model, would be a project of major magnitude and a process of several years to implement. The economic and social impact would be substantial. A detailed port reform process was beyond the scope of the development of the Business Plans for the Major Ports. Nevertheless it is worthwhile to analyse the institutional setting of the port sector in India, and provide some suggestions for changes. This will be dealt with in the following section.

9.3 Institutional setting and port reform processes

As mentioned above, all Consultants have provided recommendations for improvements of the internal structure of the Port Trusts. Unfortunately only few Consultants have looked at the larger picture, which is the relations with the Ministry, the division of responsibilities and tasks between the Ministry and the Port Trust, the necessary level of autonomy, and suggestions for a stronger involvement of the private sector in the Indian ports.

The port reform process can be summarised in the scheme below:

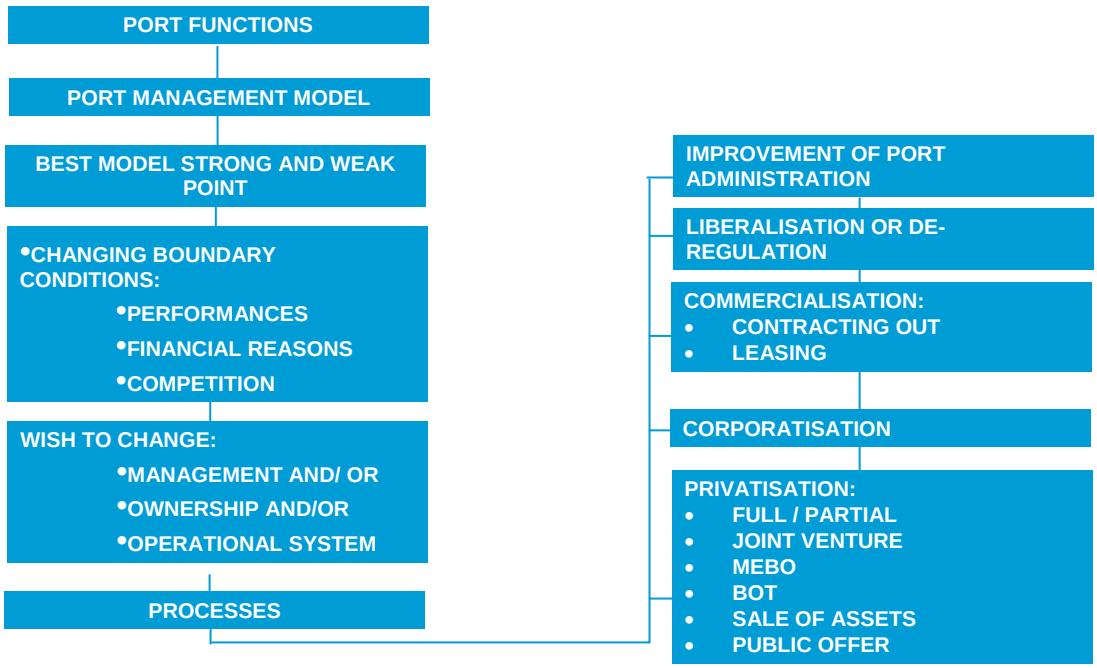

Figure 9.2 Port Reform processes and options

The port functions and port management models have already been dealt with in the previous section. Worldwide there is the tendency to shift towards the landlord port model, but this does not necessarily need to be the best model for every port. Much depends on the financial means available (the port will have to invest in infrastructure), the development of the private sector and the acceptance of a strong presence of the private sector in strategic assets like ports.

Changing boundary conditions may lead to the wish to change the management structure and/or the ownership structure and/or the operational system of the port. In India the reasons for change would be:

- The strong economic growth, requiring more efficiency in the ports;
- The introduction of competition to reduce port tariffs;
- To reduce bureaucracy;
- To speed up the decision making process, needed to match the strong economic growth.

Once it has been established and agreed upon between the respective authorities, that changes in the management / ownership / operations will improve one or more of the inefficiencies listed, the decision has to be taken which process of change to adopt.

Taking into account the 5 principle port reform processes as presented in the scheme above, the present situation within the 12 Major Ports is as follows:

Improvement of port administration
As stated above, recommendations are given by all Consultants. It should be mentioned that this port reform option is not far-reaching. It assumes that performance can be improved even in an environment of bureaucratic constraints. The advantage is that certain changes can be made to the organisation relatively easily, without changes in law or national policy. It is in fact the easiest option to pursue, but for the Indian context it is considered to be insufficient to reach the goal to become world class facilities.

Liberalisation
Liberalisation introduces a private organisation in certain port activities previously reserved to the public sector, based on the belief that ports not subject to competition have less pressure to be efficient and respond to port user demands. An example of liberalisation is JNPT, where apart from the public container terminal also two private terminals are operating (on a BOT basis). The public terminal must be able to be at least as efficient as the private terminals in order not to lose clients. The only danger in this situation is that JNPT might give privilege to clients of its own terminal in certain occasions. A disadvantage of liberalisation is that the Port Trust might cross-subsidise unprofitable services from the profitable ones.

Commercialisation
Essentially, commercialisation creates an environment in which the port is expected to run on a commercial basis. This involves a variety of business-like decisions that need to be made promptly, without referring the issues to the controlling authorities first. Commercialisation allows port management to conduct its own affairs and most importantly, makes it accountable for its decisions and performance.
In case it is decided that the landlord port management model should be the preferred model for the Major Ports, commercialisation will be indispensable in the process. This will include:

- Delegation of powers and responsibilities from the Ministry to the ports. It was beyond the scope of this exercise to determine in detail which powers and authorities and to what extent, this should be further investigated. The goals should be faster decision making and increasing competition between the Major Ports;
- The ports should contract out certain non core-business related functions to the private sector (such as dredging, maintenance);
- Leasing out of infrastructure to the private sector. This is already the case in some of the Major Ports such as Ennore and Visag;
- Invest in infrastructure, whereby new BOT concession contracts should be avoided (this will be explained below).

Corporatisation
The Port of Ennore is the only corporatised Major Port in India, and it is with some envy that the other Major Ports look at this situation. Ennore has more freedom (it does not fall under the TAMP regulations for example) and operates as a landlord. Corporatisation transforms public sector organisations into companies operating as if they were a private sector company, while the shares of the new company are still in the hands of the public sector. The purpose is to distance the enterprise from direct government control. This process can be a catalyst for commercialisation and is, in fact, privatisation without divestment. Corporatisation is high on the agenda in India, but it is recommendable to focus on commercialisation first.

Privatisation
In this type of port reform, the transfer of ownership, and therewith a flow of funds from the private sector to the public sector, is involved.
The major goal is overall improvement of the functioning of a port, but in fact it provides the same flexibility to management as commercialisation. In the past decades governments were sometimes too eager to follow the concept of privatisation, while it is the most complex one of all port reform options.

There are various forms of privatisations: there is a flow of money involved and/or investments made by the private sector in the case of selling shares to a company or consortium (full or partial), joint ventures, management-employee buy-outs, sale of assets, public offers, and BOT-type concessions.

The BOT principle needs special attention since it is widely promoted in the Major Ports. The private company invests in all infrastructure (including the quay wall) and superstructure and employs its own labour. In this sense the Indian BOT represents its purest sense, while worldwide the public port authorities invest normally also in the basic infrastructure, at least the quay wall. In India the Port Trusts generally invest in dredging only. On top of the investments made by the BOT operator, he also offers the Port Trust a revenue share, which is often in the range of 40-50%. This implies that the costs for the port users become very high and therefore it is not surprising that the Indian ports are notorious for their high tariffs. Moreover, private companies apply a much shorter pack-back period on their investments than public entities, which is another cost-raising element. Since there are sufficient funds available within the Port Trusts, the port users would benefit from a situation whereby the Port Trust would invest in infrastructure instead of a BOT operator, thereby following the principle of a landlord port.

9.4 Possible future institutional setting

Taking the above port reform options into account as well as the intention of the Indian Major Ports to shift towards the landlord port model, it can be concluded that there are several reasons to justify such a process:

- India is in the stage of becoming a developed country, economic growth is high leading to huge growth of cargo in the ports;
- There are sufficient resources available within the ports to make a landlord port management model possible;
- There is a national policy to increase the role of the private sector in the ports.

The following suggestions for implementations are made. Obviously these are rough outlines and need to be further studied and detailed:

- The ministry delegates (part of) its powers, in order to provide more autonomy to the Port Trust, with the aim to increase competition, improve efficiency and speed up the decision making process;

- The Ministry will not invest in port infrastructure, this should be done by the Port Trusts. Apart from ample available funds, most Port Trust also have sufficient borrowing capacity;

- The Port Trust could invest in infrastructure, thereby avoiding the BOT concept. The private sector will then lease port area from the Port Trust, including the quay wall, on the basis of a long term contract;

- The lease could be a flat-rate lease and in case the Port Trust wants to cover its investments risk, some kind of combination of flat-rate with revenue share could be applied. In all cases the lease income for the Port Trust should reflect its investments made on which a reasonable return can be made;

- The Port Trust will sell its superstructural assets to private operators who tender for specific terminals or activities;

- Port workers employed by the Port Trust should have the possibility to choose between a transfer to the private port operator or accept a certain voluntary retirement scheme which need to be drafted with the utmost care. Since the private port operators will tend to employ the least possible number of workers, also a labour pool could be established in the port that could serve all operators in peak periods;

- The Port Trust will contract out non-core business to the private sector such as dredging, pilotage, towing, mooring and unmooring;

- The Port Trust will pay more attention to the boundary conditions in which the private sector can function best. This could vary from a joint marketing effort to attract cargo to the port, to a joint venture with a private operator in hinterland connectivity projects, to safeguard the transport facilities to the hinterland.

In the process the issue will be how to define the government's role so that it is not a significant barrier to port performance and efficiency, but on the contrary a facilitator of trade and a promoter of port competition.
Commercialisation, corporatisation and privatisation may introduce monopolistic effects by private operators and may encourage the strategy of strict, contractually assured control over tariffs (TAMP), charges and quality of services. In giving private operators reasonable room in setting tariffs, the issue is how to preserve the ability of private operators to make a reasonable profit, maintain adequate service to the users and yet protect shipping from excessive charges. The IPA could play an important role in this respect.
Possible roles of the IPA in the new situation could be:

- Focus less on port planning (this will be a task of each port), but more on the overall interests of the Indian ports;
- Encourage competition;
- Guard over possible arising private sector monopolies and control these by means of tariff agreements;
- Encourage improvements in hinterland connectivity;
- Encourage transition to the landlord concept;
- Work with the Ministry on deregulation and possible corporatisation;
- Encourage an equal level playing field with the private and minor ports.

As an example of the overall interests of the Indian Ports, IPA might evaluate and promote the required and possible co-operation between Port Trusts and other Central-, State-, City- and local governments. The Port of Mormugao for example is limited in port area. Co-operation between Port Trust, State Government and

Inland Waterway Authority in an Estuary Agency or Authority might lead to port development options outside the present Port Trust boundaries.

10 Financial issues

10.1 General

The Consultants of the individual ports produced a Final Report, which included the Business Plan of the individual port. The backbone of each Business Plan was formed by the financial projections. The financial projections were summarized in projected financial statements.

At the start of the process the Advisor produced an information outline in which a format for the statements was given. Consultants have used this format.
These statements comprise of a:

- Projected profit and loss account;
- Projected balance sheet;
- Projected cash flow statement.

These statements were made for a period of 20 years starting in the financial year 2007-2008 and ending in the financial year 2025-2026.

In order to make a consolidated Business Plan for the 12 Major Ports, the Advisor used the figures coming from the financial accounts, without making changes or eliminations. The figures of the 12 ports were compiled.

The first 7 years of the projections were in line with the 7-year action plan. Most of the emphasis of the Consultants has put on this 7-year period.
In general the Advisor found the next trends followed by most of the Consultants for the second period (13 years):

- Revenues have been calculated by extrapolating the trend in the first period;
- Few projects has been defined;
- Tariffs have been kept constant or have been inflated.

As a result the last 13 years of the financial statements did not produce a realistic financial picture. The outcome for this period shows:

- Relative high net earnings;
- Huge amount of available funds in the later year of the projections;
- High solvency.

The figures that the Advisor shows over the last 13-year period and especially over the year 2025-26 are meant as an illustration and not as a reliable projection. The Advisor's conclusions are only based on the first 7-year period and never based on the second period.

10.2 Projects

10.2.1 Investments in fixed assets

Many projects have been identified for the period 2007-08 to 2013-14. An overview is presented in Annex 2.

The investments in fixed assets for the 12 Major Ports are expected to be financed by the internal reserves of the Ports and amount to Rs 16.059 Crores for this period.
The details over the years and over the ports are as follows:

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total	perc
Kandla	84	132	167	71	74	30	42	**600**	**4%**
JNPT	421	1.000	832	768	720	511	127	**4.379**	**27%**
Mumbai	277	767	673	439	359	223	159	**2.897**	**18%**
Mormugao	284	140	90	10	10	10	10	**554**	**3%**
New Mangalore	60	93	88	48	28	25	25	**367**	**2%**
Cochin	75	201	280					**556**	**3%**
Tuticorin	270	295	572	595	493	75	18	**2.318**	**14%**
Chennai	197	68	120	68				**453**	**3%**
Ennore	96	166	250	209	27			**748**	**5%**
Visak	170	275	266	180	159	45	1	**1.096**	**7%**
Paradip	363	221	98	183	94	68	170	**1.197**	**7%**
Kolkata	83	365	175	128	104	20	19	**894**	**6%**
Total	**2.380**	**3.723**	**3.611**	**2.699**	**2.068**	**1.007**	**571**	**16.059**	**100%**
Percentage	**15%**	**23%**	**22%**	**17%**	**13%**	**6%**	**4%**	**100%**	

Table 10.1 Investments in fixed assets financed by internal resources of the 12 Major Ports in Rs Crores

- The investments reach the highest level in the years 2008-09 and 2009-10, after these years the investments are declining to Rs 571 Crores in 2013-14;
- The highest level of investments for the individual ports was for JNPT, Rs 4.378 Crores (which is 27% of the investments of all 12 Ports) followed by Mumbai and Tuticorin;
- In Cochin, New Mangalore, Mormugao and Chennai the level of investments from their own resources was relatively low. For each of these ports it was 3% or less of the total of all 12 Ports.

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total	perc
Kandla	180	404	3.984		65	390		**5.023**	**19%**
JNPT	2.678	981	2.905	3.879		279		**10.722**	**41%**
Mumbai	250	250	734	162	96	142		**1.634**	**6%**
Mormugao	140							**140**	**1%**
New Mangalore	889	207	224					**1.320**	**5%**
Cochin	91	55	319					**465**	**2%**
Tuticorin	109	50	30	30	30	30	39	**318**	**1%**
Chennai						45		**45**	**0%**
Ennore	538	1.090	650				298	**2.576**	**10%**
Visak	187	940	30	240			270	**1.667**	**6%**
Paradip		581	239	239	551		29	**1.639**	**6%**
Kolkata	158		345	105				**608**	**2%**
Total								**26.157**	

Table 10.2 Investments in fixed assets financed by private sector in Rs Crores

10.2.2 Financial Performance

The projected financial performance for the 7-year period is highlighted in the projected profit and loss account. The complete overview, in line with the before mentioned format, is presented in Annex 3. An extract is presented in the following table.

Projected profit and loss account	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Operating revenue	5.446	6.246	6.775	7.589	8.108	8.747	9.375
Operating costs	3.729	3.975	3.761	4.047	4.121	4.209	4.441
Operating margin	**1.717**	**2.270**	**3.014**	**3.542**	**3.987**	**4.537**	**4.934**
Other income	949	1.006	1.060	1.130	1.237	1.406	1.544
Depreciation	-369	-437	-546	-593	-629	-692	-699
Interest	-169	-220	-274	-262	-297	-348	-308
Profit before tax	**2.129**	**2.619**	**3.255**	**3.817**	**4.297**	**4.904**	**5.470**
Tax	-635	-747	-983	-1.084	-1.186	-1.362	-1.520
Profit after tax	**1.494**	**1.872**	**2.272**	**2.733**	**3.112**	**3.542**	**3.950**

Table 10.3 Extract projected profit and loss account 12 Major Ports in Rs Crores

The following items will be worked out hereafter:

- Operating revenue;
- Operating costs;
- Operating margin;

- Total costs;
- Profit after tax.

10.2.3 Operating revenue

The operating revenue is given in the following categories:

- Vessel related charges including:
  - Port dues;
  - Other dues, such as berth hire, towage, pilotage.
- Cargo related charges including:
  - Storage;
  - Wharf handling;
  - Stevedoring revenue.
- Concession fee including:
  - Revenue share;
  - Lease.
- Other operational income including:
  - Railway;
  - Real estate.

An overview is given in the following table:

Operating revenue	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	% 2013-14
Vessel related charges	1.564	1.724	1.848	2.162	2.303	2.480	2.664	28%
Cargo related charges	2.561	2.839	2.784	2.747	2.898	3.044	3.184	34%
Concession fee and lease	598	813	1.119	1.574	1.732	1.933	2.146	23%
Other operational income	722	870	1.024	1.106	1.175	1.291	1.380	15%
Total operating revenue	**5.446**	**6.246**	**6.775**	**7.589**	**8.108**	**8.747**	**9.375**	**100%**

Table 10.4 Revenues all Major Ports 2007-14 in Rs Crores

- Cargo related charges is the most important category of revenue, in 2007-08 this was Rs 2.561 Crores, in 2013/14 it was Rs 3.184 Crores, this was 34% of total revenue;
- Vessel related charges form the second category in importance. It was Rs 2.664 Crores in 2013-14, which is 28% of revenue;
- All ports planned to use BOT contracts for development in terminals. As a result the incremental revenue for cargo related charges will be collected by the BOT operator on his account. The port will receive a concession fee in the form of revenue share and/or lease;
- The importance of concession fee for the Port will increase.

The relative increase in the different categories of revenue will be shown in the following table:

Revenue increase	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Vessel related charges	10%	7%	17%	7%	8%	7%
Cargo related charges	11%	-2%	-1%	5%	5%	5%
Concession fee and lease	36%	38%	41%	10%	12%	11%
Other operational income	20%	18%	8%	6%	10%	7%
Total revenue increase	**15%**	**8%**	**12%**	**7%**	**8%**	**7%**

Table 10.5 Increase in revenue per category in the period 2007-08 to 2013-14 for all Major Ports

- The vessel related charges show a stable increase in each year of the projected period. In the year 2010-11 there is an incidental high increase;
- The cargo related charges show a decline in the years 2009-10 and 2010-11, in these years most BOT contracts will be commissioned;
- The high increase in concession fee is caused by a number of new BOT contracts that will be commissioned and BOT contracts that have been commissioned recently;
- Other operational income shows a high increase in the first 2 years and a stable increase after that.

For each Port this pattern is different, in the next table the increase per Port is shown:

Port Trust	Kand	JNPT	Mumb	Morm	Mang	Coch
Operating revenue						
2007-2008	266	838	950	287	261	199
2013-2014	753	1.841	1.537	354	345	502
Increase in 7 years	**183%**	**120%**	**62%**	**24%**	**32%**	**153%**
increase per year	**31%**	**20%**	**10%**	**4%**	**5%**	**25%**

Port Trust	Tuti	Chen	Enno	Visak	Para	Kolk	Total
Operating revenue							
2007-2008	203	521	125	515	616	664	**5.446**
2013-2014	389	735	546	755	769	848	**9.375**
Increase in 7 years	**91%**	**41%**	**337%**	**46%**	**25%**	**28%**	**72%**
increase per year	**15%**	**7%**	**56%**	**8%**	**4%**	**5%**	**12%**

Table 10.6 Increase in revenue per Port for the period 2007-08 to 2013-14, in Rs Crores

- Total increase in operating revenue for the 7-year period was 72%; this is 12% per year;
- The highest increase comes from Ennore, however the starting point for Ennore is rather low since this a relatively new port;
- Other ports with high increases are Kandla, JNPT, Cochin and Tuticorin;
- Relatively low increases are coming from Paradip and Mormugao (each 4% per year).

As elaborated before the outcome for the 13-year period cannot be regarded as being realistic. Nevertheless the figures are given as an illustration in the next table.

Revenue	2007-08	2013-14	2025-26
Vessel related charges	1.564	2.664	5.046
Cargo related charges	2.561	3.184	4.711
Concession fee and lease	598	2.146	5.064
Other operational income	722	1.380	2.245
Total revenue	**5.446**	**9.375**	**17.066**

Table 10.7 Operational revenue at the end of the 13-year period for the 12 Major Ports in Rs Crores

- In the 20-year period the total operational revenue is projected to increase threefold to Rs 17.066 Crores in the year 2025-26;
- The highest increase is projected to be in concession fees and lease, an 8 fold increase to Rs 5.064 Crores, which makes it the most important category of revenues.

10.2.4 Operating costs

The operating expenses will be given in the following categories:

- Salaries;
- Social charges and pension premiums;
- Running costs including dredging costs minus dredging reimbursements;
- Administrative costs;
- Other costs.

An overview is given in the following table:

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	%
								2013-14
Salaries	1.466	1.503	1.476	1.529	1.542	1.581	1.617	36%
Social charges and pension premiums	809	839	765	790	723	567	599	13%
Running costs	1.096	1.246	1.043	1.264	1.417	1.587	1.720	39%
Administrative costs	206	224	231	254	261	279	294	7%
Other costs	153	163	245	211	178	195	210	5%
Total operating expenses	**3.729**	**3.975**	**3.761**	**4.047**	**4.121**	**4.209**	**4.441**	**100%**

Table 10.8 Operating expenses for the 12 Major Ports for the period 2007-08 to 2013-14 in Rs Crores

- Total operating expenses increased from Rs 3.729 Crores in 2007-08 to Rs 4.441 Crores in 2013-14;

- The most important category is salaries. The number of employees is expected to decrease due to vtary retirement programmes and mechanization projects;
- All ports have created Pension funds All ports transferred their pension liabilities and the relevant investments in financial assets to a separate fund. Some ports have fully contributed and in some ports there are backlogs;
- The social charges and pension premiums are relatively high in the first 4 years due to a backlog in the related separate pension funds;
- Acturial valuations were the basis of backlog;
- The running costs are influenced by the dredging costs in Kolkata and the reimbursements of the dredging costs in Kolkata by the Government of India;
- The fluctuation in dredging costs and the fluctuation in the reimbursements influence the spread over the year. This factor is also the cause of the fluctuations in the total of the operational costs.

The relative increase in the different categories of expenses will be shown in the following table:

Expenses increase	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Salaries	3%	-2%	4%	1%	3%	2%
Social charges and pension premiums	4%	-9%	3%	-9%	-22%	6%
Running costs	14%	-16%	21%	12%	12%	8%
Administrative costs	9%	3%	10%	3%	7%	5%
Other costs	7%	50%	-14%	-15%	9%	8%
Total increase in operating expenses	**7%**	**-5%**	**8%**	**2%**	**2%**	**5%**

Table 10.9 Increase in revenue per category in the period 2007-08 to 2013/14 for all Major Ports

- The total operating expenses show a modest increase in the 7-year period;
- The voluntary retierment programmes influence the fluctuation in salaries.

The outcome for the 13-year period cannot be regarded as being realistic nevertheless the figures are given as an illustration in the next table:

	2007-08	2013-14	2025-26
Salaries	1.466	1.617	2.489
Social charges and pension premiums	809	599	611
Running costs	1.096	1.720	3.484
Administrative costs	206	294	555
Other costs	153	210	430
Total operating expenses	**3.729**	**4.441**	**7.568**

Table 10.10 Operational expenditure at the end of the 13-year period for the 12 Major Ports in Rs Crores

- The total operating expenses double in the 20 year period;
- The highest increase is in the running costs as most of the costs in this category are to a certain degree variable and experience more influence from the high growth in throughput compared with the other cost category, which have a more fixed character.

10.2.5 Operating margin

The operating margin is defined as the operating revenue minus the operating costs. It is important to notice that interest and depreciation form no element in the operating margin.

In the following table the operating margin is shown:

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Operating margin	1.717	2.270	3.014	3.542	3.987	4.537	4.934
increase operational margin		32%	33%	17%	13%	14%	9%

Table 10.11 Operating margin for the 12 major Ports for the period 2007-08 to 2013-14 in Rs Crores

- The operating margin increases from Rs 1.717 in 2007-08 to Rs 4.934 Crores in 2013-14; this is nearly three-fold;
- The increase is most spectacular in the first 3 years, after that the increase flattens but maintains a high level.

The difference per port can be seen in the following table:

Port Trust	Kand	JNPT	Mumb	Morm	Mang	Coch
operating margin						
2007-2008	135	538	-44	54	113	31
2013-2014	586	1.367	576	117	166	290
Increase in 7 years	**335%**	**154%**	**1405%**	**118%**	**47%**	**821%**
increase per year	**56%**	**26%**	**234%**	**20%**	**8%**	**137%**

Port Trust	Tuti	Chen	Enno	Visak	Para	Kolk	Total
operating margin							
2007-2008	121	173	95	96	246	159	**1.717**
2013-2014	250	281	497	412	420	-27	**4.934**
Increase in 7 years	**106%**	**63%**	**423%**	**327%**	**71%**	**-117%**	**187%**
increase per year	**18%**	**10%**	**71%**	**55%**	**12%**	**-19%**	**31%**

Table 10.12 Operating margin per port for the years 2007-8 and 2013-14, amounts in Rs Crores

- The highest operating margin is projected for JNPT (Rs 1.367 Crores in 2013-14);
- The highest increase is for Mumbai, but this port started with a negative operating margin. Kolkata Port Trust is the only port with a negative margin in 2013-14.

10.2.6 Total costs

The total expenses for all 12 Major Ports consist of:

- Operating expenses;
- Depreciation;
- Interest.

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	%
								2013-14
Operating expenses	3.729	3.975	3.761	4.047	4.121	4.209	4.441	**82%**
Depreciation	369	437	546	593	629	692	699	**13%**
Interest	169	220	274	262	297	348	308	**6%**
Total expenses	**4.266**	**4.632**	**4.581**	**4.902**	**5.047**	**5.249**	**5.448**	**100%**

Table 10.13 Total expenses for 12 Major Ports 2007-08 – 2013-14 in Rs Crores

- The operating expenses form 82% of the total expenses in 2013-14; depreciation is 13% and interest 6%.

10.2.7 Profit after tax

Projected profit after tax over the 7-year period is presented in the following table:

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
PAT	1.494	1.872	2.272	2.733	3.112	3.542	3.950
increase PAT		25%	21%	20%	14%	14%	12%
Revenue	5.446	6.246	6.775	7.589	8.108	8.747	9.375
PAT in % of revenue	27%	30%	34%	36%	38%	40%	42%

Table 10.14 Projected profit after tax for the 12 Major Ports for the 7-year period and as a percentage of revenue, in Rs Crores

- Profit after tax (net earnings) for the 12 Major Ports of India is projected at Rs 1.494 Crores in 2007-08, rising to Rs 3.950 in 2013-14;
- The highest increase is in the first 3 years. After that the increase stabilizes;
- In relation to revenue the PAT is 27% in 2007-08 and increases to 42% in 2013-14;
- The high increases are in line with the monopolistic situation of the Ports;
- Such a situation is directly at the expense of the port users.

The PAT per port is presented in the following table:

Port Trust	Kand	JNPT	Mumb	Morm	Mang	Coch	
PAT							
2007-08	167	378	176	33	97	32	
2013-14	650	993	572	91	134	208	
Increase in 7 years	290%	163%	224%	177%	39%	544%	
increase per year	48%	27%	37%	29%	6%	91%	
Port Trust	**Tuti**	**Chen**	**Enno**	**Visak**	**Para**	**Kolk**	**Total**
PAT							
2007-2008	83	132	44	56	172	125	**1.494**
2013-2014	55	239	403	249	258	98	**3.950**
Increase in 7 years	-34%	80%	825%	347%	50%	-22%	**164%**
increase per year	-6%	13%	137%	58%	8%	-4%	**27%**

Table 10.15 Projected profit after tax per port 2007-08 – 2013-14 in Rs Crores

- The highest increase is in Ennore with 137% each year, followed by Cochin. (91% per year);
- Only Kolkata and Tuticorin are projected with a decrease in PAT.

10.3 Financial Situation

10.3.1 Overview

The projected financial situation for the 12 Major Ports can be derived from the projected Balance sheet.

	2007	2008	2009	2010	2011	2012	2013
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Assets							
Fixed assets	9.849	13.095	16.227	18.196	19.563	19.850	19.805
Investments	11.097	10.791	10.897	11.593	12.768	14.780	17.085
Current assets	5.415	5.783	5.787	6.162	6.458	6.840	7.256
Liquid means	3.587	3.485	3.576	3.806	4.404	5.250	6.623
Total assets	**29.948**	**33.154**	**36.487**	**39.757**	**43.193**	**46.720**	**50.769**
Equity and liabilities							
Equity	1.473	1.843	2.155	2.424	2.624	2.699	2.704
Reserves	17.808	19.752	22.129	24.755	27.878	31.456	35.529
Total own equity	**19.281**	**21.595**	**24.283**	**27.178**	**30.502**	**34.155**	**38.233**
Provisions	2.522	2.667	2.717	2.766	2.933	3.108	3.267
Long term loans	2.278	2.848	3.364	3.538	3.432	2.956	2.605
Short term liabilities	5.868	6.044	6.123	6.275	6.326	6.501	6.664
Total equity and liabilities	**29.948**	**33.154**	**36.487**	**39.758**	**43.194**	**46.720**	**50.769**

Table 10.16 Projected balance sheet 12 Major Ports 2007-08 – 2013-14 in Rs Crores

The projected balance sheet shows a healthy picture, and over liquidity. The important elements will be analyzed hereunder.

10.3.2 Fixed assets

The change in fixed assets over the period in the projection was as follows:

Book value at start	Rs 7.720 Crores
Investments in fixed assets	Rs 16.050 Crores
Depreciation	Rs 3.965 Crores
Book value at the end	Rs 19.805 Crores

10.3.3 Investments and liquid means

Investments (financial fixed assets) and liquid means are available for future investments in fixed assets as far as they are not blocked to secure pensions and other reserves.

The available funds (not taking into account the blocked funds) are as follows:

Available funds	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Investments	11.097	10.791	10.897	11.593	12.768	14.780	17.085
Liquid means	3.587	3.485	3.576	3.806	4.404	5.250	6.623
Total available funds.	14.684	14.276	14.473	15.399	17.172	20.030	23.708

Table 10.17 Available funds in Rs Crores

- The available funds increase from Rs 14.684 Crores in 2007-08 to Rs 23.708 Crores in 2013-14;
- According to an email received from IPA at the 10th April 2007, the available funds for investments in fixed assets at 31-3-2007 were Rs 7.370 Crores. The interpretation of the Advisor is that in 2007-8 an amount of Rs 7.314 Crores is blocked to secure pension funds and other reserves;
- The available funds for investments at the end of the 7-year projection period will be Rs 23.708 Crores minus Rs 7.314 Crores; this is more than Rs 16.000 Crores;
- The increase in the year 2007-08 is not known and has been neglected.
- As some of the ports have not contributed fully to Pension Fund there will be some some more transfer to Pension Fund in the coming years (see section 10.2.24).

10.3.4 Solvency

The solvency of the 12 Major Ports in the 7-year period of the projections can be defined as the total of own equity divided by the total of all assets.

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Own equity	19.281	21.595	24.283	27.178	30.502	34.155	38.233
Total assets	29.948	33.154	36.487	39.757	43.193	46.720	50.769
Solvency	64%	65%	67%	68%	71%	73%	75%

Table 10.18 Solvency of the 12 Major Ports 2007-08 to 2013-14

- The solvency increases from 64% in 2007-08 to 75% in 2013-14;
- The solvency ratio is rather high.

The solvency for the individual ports is as follows:

Port Trust	Kand	JNPT	Mumb	Morm	Mang	Coch	
solvency							
2007-2008	95%	78%	75%	52%	68%	34%	
2013-2014	98%	98%	78%	60%	81%	72%	
Port Trust	**Tuti**	**Chen**	**Enno**	**Visak**	**Para**	**Kolk**	**Total**
solvency							
2007-2008	65%	50%	43%	70%	55%	49%	64%
2013-2014	42%	56%	88%	76%	75%	57%	75%

Table 10.19 Solvency per port

- The solvency for Kandla and JNPT will increase to 98% in 2013-14;
- The solvency for all Ports will increase except for Tuticorin;
- In Tuticorin the solvency will decrease to 42%, which will be the lowest ratio of all ports.

10.3.5 Long term loans

The borrowing capacity of all Major Ports based on above mentioned solvency is high. Nevertheless long-term loans are relatively low.

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Long term loans	2.278	2.848	3.364	3.538	3.432	2.956	2.605

Table 10.20 Long-term loans in Rs Crores

In the first years of the 7-year projection period the loans increase with about 50%; but due to repayments at the end of the period the loans are nearly reduced to the starting level.

Port Trust	Kand	JNPT	Mumb	Morm	Mang	Coch	
long term loans							
2007-2008	16	400	0	170	78	324	
2013-2014	16	0	0	191	0	136	
Port Trust	**Tuti**	**Chen**	**Enno**	**Visak**	**Para**	**Kolk**	**Total**
long term loans							
2007-2008	287	16	389	206	281	111	**2.278**
2013-2014	1450	1	162	313	295	41	**2.605**

Table 10.21 Long term loans per port in Rs Crores

- At the end of the 7-year period there are 4 ports without long-term loans; these ports did not use the borrowing capacity;
- Only one port (Tuticorin) increased their long-term loans with a substantial amount.

10.4 Comparison with Rotterdam

10.4.1 General

In this part of the report a comparison has been made between the aggregated financial figures of the Major Ports of India with the Port of Rotterdam. Of course one has to be careful with benchmarking because there is always the risk of comparing apples with oranges. Therefore it is good to be conscious of the differences and similarities between the Major Ports and the Port of Rotterdam.

Major differences:

- The Major Ports are first and second generation (service) ports; The Port of Rotterdam is a third generation (landlord) port;
- There is a fierce competition between the ports in Western Europe, while the competition between the Indian ports is still limited;
- There is a difference in economic growth rates in India and Western Europe;
- The Indian economy grows with 8% per year while the economy in Western Europe only grows with 2% per year.

Major similarities:

- The cargo volumes are approximately similar. In 2006 the traffic volume in Rotterdam was at 90% of the total traffic volume of the Major Ports in India;
- Rotterdam is a multicargo port that handles all commodities that are handled by the Major ports in India;
- In India, as well as in Rotterdam, there is an emphasis on bulk cargo;
- The Major Ports and the Port of Rotterdam both have expansion plans and face high investments in the near future to accommodate the growing cargo volumes.

10.4.2 Traffic Forecasts

In 2005-06 the Major Ports in India together handled 420 M tons: in Rotterdam this was 380 M tons. At this moment Rotterdam handles 90% of the cargo volume that is handled by the Major Ports in India. However, the volumes in India are increasing much faster than in Rotterdam.
In 2013 the Major Ports already will handle twice as much cargo as will be the case in Rotterdam.

	2006	2013	2026	2006-2026
Major Ports India	420	814	1.450	245%
Port of Rotterdam	380	430	595	60%

Table 10.22 Traffic forecast in the Major Ports and in Rotterdam in M tons

10.4.3 Investments in fixed assets

The enormous growth in cargo volumes is reflected in the investments in fixed assets.
In the next 7 years, the Major Ports in India will be investing 16.000 Crores. In the same period the investments in Rotterdam will add up to 14.000 Crores (85% of the Indian investments).

The focus in India is on the first 3 years. The focus in Rotterdam is somewhat broader:

- Large investments are not only planned in the first 3 years, but also in the last year of the projected period (and even beyond this period).

Long term planning is important to anticipate on the traffic forecasts.

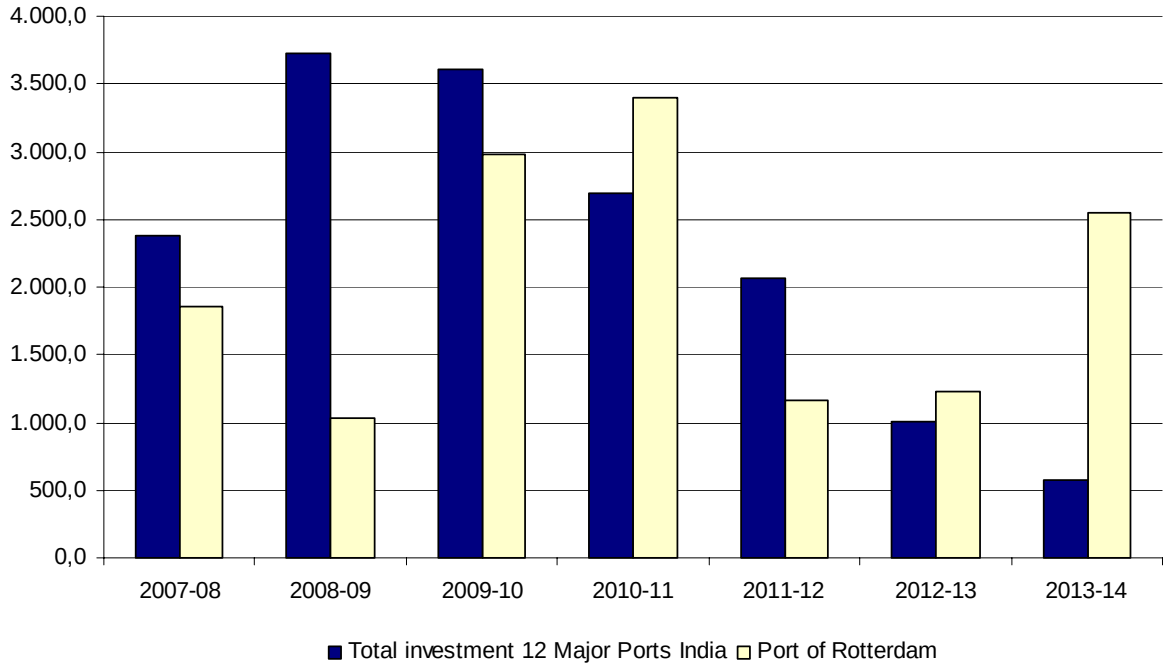

Figure 10.1 Comparison investments Major Ports in India and Rotterdam in Rs Crores

10.4.4 Revenues

	2007-08	2013-14	Growth
Major Ports India	5.400	9.400	74% (12% pa)
Port of Rotterdam	2.800	3.600	29% (5% pa)

Table 10.23 Comparison of Revenues Major Ports in India and Rotterdam in Rs Crores

- The revenues of the Major ports are at this moment approximately twice as high as the revenues of the Port of Rotterdam;
- In the next 7 years the revenues of the Major Ports will almost double while the revenues of the POR only will grow with 30%.

10.4.5 Operating expenses

	2007-08	2013-14	Growth
Major Ports India	3.700	4.400	19% (3% pa)
Port of Rotterdam	1.300	1.600	23% (4% pa)

Table 10.24 Operating expenses in Rs Crores

- The operating expenses of the Major Ports are approximately 3 times higher than in the Port of Rotterdam. The most important component of the operating expenses of the Major ports are salaries and social charges. In Rotterdam this cost component is relatively small. The reason is that the Major Ports are service ports and the Port of Rotterdam is a landlord port;
- The growth of the operating expenses at the Major Ports is moderate, 19% in the 7-year period. Most ports are downsizing the number of employees in this period and new terminals are BOT contracts;
- The growth of operating expenses in the 7-year period at the Port of Rotterdam is slightly higher, 23%, mainly because of increasing maintenance costs.

10.4.6 Financial performance: Operating margin and PAT

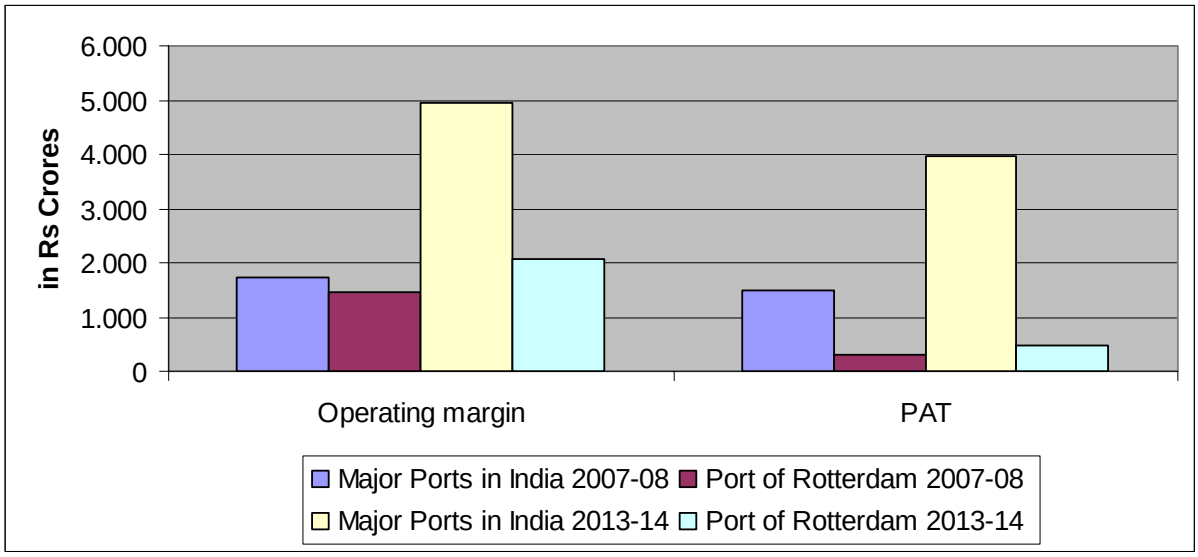

Figure 10.2 Operating margin and PAT in Rs Crores

- Concentrating on the operating margin, which is revenue less operating expenses, it can be concluded that the operating margin in the year 2007-08 is approximately at the same level for the Major Port and the Port of Rotterdam;
- But in 7 years the growth of the revenues of the Major Ports is enormous. In Rotterdam the growth is much more modest;
- The PAT in 2007-08 of the Major Ports is already much higher than in Rotterdam;
- The growth in the 7 year period for the Indian ports is also much higher.

	2007-08	2013-14	Growth
Major Ports India	1.700	4.900	188% (31% pa)
Port of Rotterdam	1.500	2.100	40% (7% pa)

Table 10.25 Operating margin in Rs Crores

The exact figures show a growth of the operating margin at the Indian ports of 188%, against 40% in Rotterdam.

	2007-08	2013-14	Growth
Major Ports India	1.500	4.000	167% (28% pa)
Port of Rotterdam	300	470	57% (9% pa)

Table 10.26 Profit after tax in Rs Crores

- The PAT in the Major Indian Ports at the moment is 5 times higher than in Rotterdam. In 7 years time the PAT is 10 times higher than in Rotterdam;
- When considering the growth in profit margin and PAT, which is much higher in India, it is good to take into account that the investments in fixed assets in the projected period don't differ very much. Investments in India lead to much higher growth in profits than in Rotterdam.

10.4.7 Financial position

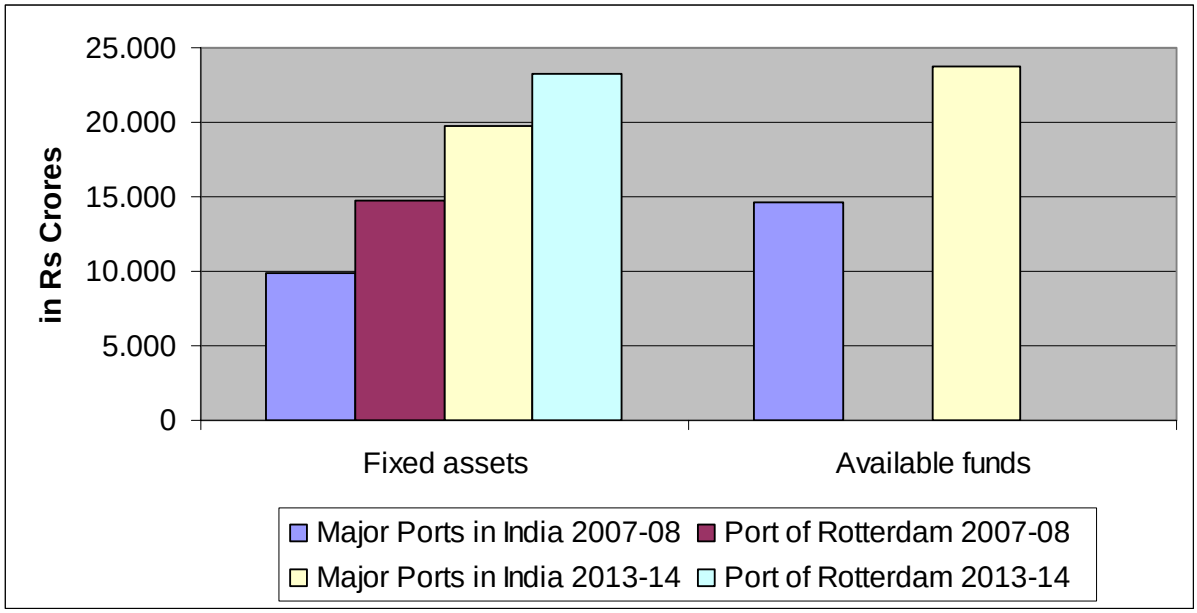

Figure 10.3 Fixed assets and available funds in Rs Crores

This figure shows the developments of the level of the fixed assets and the available funds on the balance sheets.

- In India and Rotterdam the level of fixed assets is growing, which is caused by the investments in the 7 year period. The absolute level in Rotterdam in 2013-14 is still slightly higher than in the Major Ports but the growth in India is much faster;
- At the right side of the graph the available funds are presented. It shows that during the period of investments the level of available funds in the Major Ports is increasing;
- In Rotterdam there are no available funds. This means that in periods of high investments the Port of Rotterdam has to raise debt;
- The solvency ratio in the Major Ports is steadily rising. In Rotterdam the solvency rate is decreasing from 66% to 48% in the next 7 years.

10.4.8 Solvency

	2008-09	2013-14	2025-26
Major Ports India	65%	75%	90%
Port of Rotterdam	66%	48%	66%

Table 10.27 Solvency Major Ports and Rotterdam

10.5 Financial strategy

10.5.1 General

- The 12 Major Ports of India project to invest more then Rs 16.000 Crores from their own resources during the 7-year period;
- Over the same period the 12 major Ports expect the private sector to invest some Rs 25.000 Crores via BOT contracts;
- At the end of the 7- year period the internal funds available for investments in fixed assets have augmented to Rs 16.000 Crores;
- The own equity for the 12 Major Ports at the end of the 7-year period amounted to more than Rs 38.000 Crores. The Advisor assumes a normal debt equity ratio as 1 to 1 (in line with TAMP); which indicates a borrowing capacity of Rs 38.000 Crores;
- At the end of the 7-year period the outstanding long term loans amounted to Rs 2.605 Crores. The unused part of the borrowing capacity is more than Rs 35.000 Crores;
- The financial strategy used by the Consultants and the Ports for the 7 – year period resulted in an amount of over Rs 55.000 Crores of unused funds. The Advisor concludes that this is not in line with the core function of a public port.

The Advisor summarizes the amount of usable funds at the end of the 7- year period as follows:

Elements	Rs Crores
Available funds 2007 (investments and liquid means)	14.684
Available for investments IPA 10-4	7.370
blocked for pensions etc	7.314
Investments in financial assets 2014	17.085
Liquid means 2014	6.623
Available funds	23.708
Blocked for pensions	7.314
Available for investments 2014	16.394
Equity = borrowing capacity	38.233
Existing loans	2.605
Balance	35.628
Available in 2014 in funds and borrowing capacity	
Net from investments and liquid	16.394
From unused borrowing capacity	35.628
Total available for investments in fixed assets in 2014	**52.022**

Table 10.28 Available funds for investments in fixed assets in Rs Crores

An alternative financial strategy in the 7 – year period could absorb these funds. Apart from a few ports who have limited available funds, the following alternative strategy could be followed:

- Decrease the tariffs in order to improve the competitive position and to benefit the port users;
- Decrease the revenue share in BOT contracts in order to attract terminal operators;
- Invest in port infrastructure according to the landlord port model, in order to decrease the investment costs for the port operators, therewith making the port attractive for additional operators as well (increase of competition). Terminal handling charges could then also be lowered, which is beneficial for the port users;
- Define and implement additional projects; especially in the period 2012-14.

10.5.2 Financial Strategy per port

		Funding				
	Total Investments in fixed assets 2007-14	Internal Resources	Private Sector	GOV	Debt	Available Funds for investments in fixed assets 2014
Kandla	5.623	600	5.023			8.463
JNPT	15.101	4.379	10.722			7.963
Mumbai	4.531	2.897	1.634			10.607
Mormugao	2.790	554	140	2.094		890
New Mangalore	1.687	367	1.320			2.633
Cochin	1.021	556	465			2.155
Tuticorin	2.636	2.318	318			-308
Chennai	518	453	45	20		5.115
Ennore	3.324	748	2.576			2.291
Visak	2.763	1.096	1.667			2.776
Paradip	3.610	1.197	1.639			4.352
Kolkata	2.107	894	608	551	54	5.045

Table 10.29 Investments and funding in Rs Crores

Apart from Tuticorin (negative available funds in 2014) the following alternative strategy could be followed by all Major Ports:

- Decrease the tariffs in order to improve the competitive position and to benefit the port users;
- Decrease the revenue share in BOT contracts in order to attract terminal operators;
- Invest in port infrastructure according to the landlord port model, in order to decrease the investment costs for the port operators, therewith making the port attractive for additional operators as well (increase of competition). Terminal handling charges could then also be lowered, which is beneficial for the port users;
- Define and implement additional projects; especially in the period 2012-14.

10.6 Sensitivity analyses

10.6.1 General

The Advisor concluded that the assumptions made by the Consultants in establishing the Business Plans were realistic; however these assumptions are placed in a monopolistic situation. The Advisor expects that competition in and between Ports in India will increase which will have effect on the revenues. The effects of a decrease in revenue share and in tariffs will be calculated in the sensitivity analyses.

The Consultants' projections for the ports included a reduction of the number of employees. It is questionable whether this effect can be realized. The effects of an increase in salary costs will be calculated in the sensitivity analyses.
The sensitivity analyses are calculated by the Advisor for 4 situations:

- The revenue share for new BOT contracts will be maximized at 20%;
- The vessel related charges will be decreased with 20%;
- The cargo related charges will be decreased with 20%;
- The salary costs will be increased with 10%.

For each of these analyses the effect will be given for:
- Profit after tax;
- Available funds (investments and liquid means);
- Own equity.

10.6.2 Revenue share maximized at 20%

Assumptions:
- Revenue share for existing contracts will not change;
- Revenue share for new contracts will be maximized at 20%.

The Advisor has examined the various BOT contracts on the basis of the financial models provided by the Consultants. The corrections on the revenue share are presented in the following table:

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
JNPT	0	0	0	0	0	0	0
Mumbai	0	0	0	26	27	33	39
Ennore	0	0	20	96	107	118	127
Kandla	0	0	0	0	0	0	9
Visak	0	0	0	0	0	0	0
New Mangolore	0	0	0	0	0	0	0
Chennai	0	0	0	47	54	61	68
Paradip	0	0	6	7	8	8	9
Mormugao	0	0	0	0	0	0	0
Kolkata	0	0	0	0	0	0	1
Tuticorin	0	1	5	7	8	11	16
Cochin	8	9	5	6	7	8	12
Total corrections	**8**	**11**	**37**	**189**	**211**	**239**	**281**

Table 10.30 Correction revenue share per Port and per year in Rs Crores

The new contracts with high revenue shares are expected to be operational from 2011 on; hence the corrections are in the later part of the 7 – year period. The majority of the corrections were for the contracts in Ennore and Chennai.

The effects are as follows:

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Concession fee base case	598	813	1.119	1.574	1.732	1.933	2.146
Concession fee max 20%	589	802	1.082	1.384	1.521	1.693	1.866
Difference	8	11	37	189	211	239	281
PAT base case	1.494	1.872	2.272	2.733	3.112	3.542	3.950
PAT max 20%	1.486	1.861	2.235	2.544	2.901	3.302	3.669
Available funds base case	14.684	14.276	14.473	15.399	17.172	20.030	23.708
Available funds max 20%	14.676	14.257	14.417	15.154	16.716	19.334	22.732
Own equity base case	19.281	21.595	24.283	27.178	30.502	34.155	38.233
Own equity Max 20%	19.272	21.576	24.227	26.933	30.046	33.460	37.257

Table 10.31 Effects of a 20% maximum revenue share in Rs Crores

In the year 2013-14 the profit after tax will decrease with Rs 281 Crores (7%). The cumulative effect on the available funds and the own equity is approximately Rs 1.000 Crores. The Advisor regards this as a minor effect.

10.6.3 20% Decrease in vessel related charges

Assumption:

- All vessel related charges will be decreased with 20% for all Major Ports and for the years in the 7 – year period.

The effects are as follows:

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Vessel related charges base case	1.564	1.724	1.848	2.162	2.303	2.480	2.664
Vessel related charges minus 20%	1.252	1.379	1.478	1.730	1.842	1.984	2.131
Difference	313	345	370	432	461	496	533
PAT base case	1.494	1.872	2.272	2.733	3.112	3.542	3.950
PAT minus 20%	1.181	1.527	1.902	2.301	2.651	3.046	3.417
Available funds base case	14.684	14.276	14.473	15.399	17.172	20.030	23.708
Available funds minus 20%	14.371	13.618	13.446	13.940	15.252	17.614	20.759
Own equity base case	19.281	21.595	24.283	27.178	30.502	34.155	38.233
Own equity minus 20%	18.968	20.938	23.256	25.719	28.582	31.739	35.284

Table 10.32 Effects of a 20% decrease in vessel related charges in Rs Crores

In the year 2013-14 the profit after tax will decrease with Rs 533 Crores (13%). The cumulative effect on the available funds and the own equity is about Rs 3.000 Crores. The Advisor regards this as a minor effect.

10.6.4 20% Decrease in cargo related charges

Assumption:

- All cargo related charges will be decreased with 20% for all Major Ports and for the years in the 7 – year period.

The effects are as follows:

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Cargo related charges base case	2.561	2.839	2.784	2.747	2.898	3.044	3.184
Cargo related charges minus 20%	2.049	2.271	2.227	2.198	2.318	2.435	2.548
Difference	512	568	557	549	580	609	637
PAT base case	1.494	1.872	2.272	2.733	3.112	3.542	3.950
PAT minus 20%	982	1.304	1.715	2.184	2.532	2.933	3.313
Available funds base case	14.684	14.276	14.473	15.399	17.172	20.030	23.708
Available funds minus 20%	14.172	13.196	12.836	13.213	14.406	16.655	19.696
Own equity base case	19.281	21.595	24.283	27.178	30.502	34.155	38.233
Own equity minus 20%	18.769	20.515	22.646	24.992	27.736	30.780	34.222

Table 10.33 Effects of a 20% decrease in cargo related charges in Rs Crores

In the year 2013-14 the profit after tax will decrease with Rs 637 Crores (16%). The cumulative effect on the available funds and the own equity is about Rs 4.000 Crores. The Advisor regards this as a minor effect.

10.6.5 10% Increase in salary costs

Assumption:

- All salary costs will be increased with 10% for all Major Ports and for the years in the 7 – year period.

The effects are as follows:

	2007-8	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Salary costs base case	2.275	2.342	2.241	2.319	2.265	2.148	2.217
Salary costs + 10%	2.275	2.502	2.753	3.028	3.331	3.664	4.030
Difference	0	-160	-512	-709	-1.066	-1.515	-1.813
PAT base case	1.494	1.872	2.272	2.733	3.112	3.542	3.950
PAT + 10%	1.494	1.711	1.760	2.024	2.046	2.026	2.136
Available funds base case	14.684	14.276	14.473	15.399	17.172	20.030	23.708
Available funds + 10%	14.684	14.115	13.801	14.018	14.725	16.067	17.932
Own equity base case	19.281	21.595	24.283	27.178	30.502	34.155	38.233
Own equity + 10%	19.281	21.435	23.611	25.797	28.055	30.193	32.458

Table 10.34 Effects of a 10% increase in salary costs in Rs Crores

In the year 2013-14 the profit after tax will decrease with Rs 1.813 Crores (45%). The cumulative effect on the available funds and the own equity is about Rs 6.000 Crores. The Advisor regards this as a moderate effect.

10.7 TAMP

TAMP is a Government institute that is setting a maximum to tariffs to secure that prices and profits do not become excessive.
An institute like TAMP is necessary in a monopolistic situation. When the Major Ports are operating in a more competitive situation, the function of TAMP could be changed into an institute that aims at avoiding unfair competition.

TAMP uses a cost plus model to calculate the maximum level of the tariffs used by the Indian Port Trusts.

A cost plus model could enhance a ban on efficiency. In a cost plus model there should be two elements:
- Cost estimation;
- Actual costing.

The cost estimation does not harm efficiency, but can be subjective to the profit drive of the Port Trust or the port operator.
The actual costing bans efficiency if actual costs without any correction are used to calculate the tariffs.

A combination of both elements could overcome both problems, following the next procedure:
- Initially the tariff is set on the basis of cost estimation;
- Benchmarks can be used to avoid errors;
- After a period the subsequent calculation can be matched with the cost estimation;
- Analysis of the 2 elements should produce:

- Efficiency differences;
- Volume differences;
- Price differences.

- These differences can form a basis for the final tariff setting where:
  - Efficiency differences are no basis for correction;
  - Price differences are a basis for correction;
  - Volume differences are a basis for negotiation and can result in a correction.

Cross subsidising between activities is a well-known problem that could be actual in project selection and in tariff setting. There is no general solution for this problem, because it is highly dependent on the exact situation and on the internal policy of the port Trust.

A detailed study could be carried out to develop a system that overcomes the disadvantages of the current system.

10.8 Conclusion

The sensitivity analyses for the 3 revenue reduction scenarios: each in itself shows only a minor impact on the combined financial situation of the 12 Major Ports. Even a complete combination of all 3 elements gives a moderate impact.
The sensitivity analysis for an increase in salary costs shows in itself a moderate effect on the financial situation of the 12 Major Ports.

The outcome of the above three sensitivity analyses strengthens the Advisor's recommendations on the financial strategy:

- Decrease the tariffs in order to improve the competitive position and to benefit the port users;
- Decrease the revenue share in BOT contracts in order to attract terminal operations;
- Invest in port infrastructure according to the landlord port model, in order to decrease the investment costs for the port operators, therewith making the port attractive for additional operators as well (increase of competition). Terminal handling charges could then also be lowered, which is beneficial for the port users;
- Define and implement additional projects; especially in the period 2012-14.

Annex 1 Guidelines to arrive at concessions for Port Services

Introduction
These guidelines refers to a specific request from IPA and deals with the practice of granting concessions to Private Companies for rendering certain specified Port Services.

A concession is a tool used by governments to enable private participation in the supply of infrastructure or services, while maintaining a form of control. A concession is governed by a contract, safeguarding that a government has control over the concessionaire to such an extent that the pursuit of its objectives is facilitated or in any event not jeopardised.

Port Services are services with a commercial value, rendered to port users against charges normally not included in the dues levied for the right to enter the port and/or to carry out certain activities in the port. Port Services are *nautical services* (vessel traffic services, pilotage, tugboat services, mooring services), *cargo handling services* (loading, unloading, stevedoring, administrative services) and *passenger services* (embarkation and disembarkation services).

TYPES OF CONCESSIONS
Although many different kinds of concessions exist, depending on the type of business, political situation, etc., three main types of concession may be distinguished, depending on the extent of privatisation or more precise on the nature and size of the risk transferred from a government entity to a concessionaire. These are:

- Pure concessions, i.e. BOTs and Rehabilitate-Operate-Transfers (ROTs) where the concessionaire undertakes operations and investments, whereby risks involved in operations and investments are to a considerable extent transferred to the concessionaire;
- Lease type concessions, where the concessionaire carries out the operations and the government remains responsible for the investments. Hence the concessionaire takes the operating profits and the operating risk is transferred to the concessionaire. The government remains responsible for the investment risks;
- Management concessions, with a performance related fee. In this case, although a part of the operating risks is transferred to the concessionaire, as the fee of the concessionaire varies with the performance of the operational unit, the government still bears substantial operational risk.

Combinations of these are possible. The differences in the concession type are reflected in the clauses of the concession contract, i.e. in the provisions dealing with exclusivity, risk transfer, duration, etc.

CONCESSION PROCESS
An important requirement for the process leading to granting a concession to a private enterprise is that it must be transparent. Hence, the conditions and criteria must be transparent, non-discriminative, objective, relevant and proportionate.

It is recommended to adopt a phased concession process. It must be done in a step-by-step manner, every step to be taken with utmost care, keeping in mind a feasible timeframe.

- Start;
- Preparation;
- Tendering;
- Awarding, Management and Evaluation;

Start
The start of the project is a political key decision. The decision is based on the objectives of the Port Trust derived from the Governments main objectives. It is important to formulate the objectives for privatisation/concessioning as clear as possible, because in the results of the next stages these objectives must be reflected to a large extent, e.g.:

- Better quality of Port Services;
- More efficient Port Services ;
- Minimise port operational risk;
- Minimise port investment risk;
- Rationalise port work force;
- Improve port operational safety;
- Increase return from port investments.

Preparation
In the preparation stage of the concession process the bases for the concession is provided. The project strategy, project organisation, project planning and concession conditions have to be defined and agreed upon. The necessary documents for the next stage need to be prepared and approved.

Project Strategy
This strategy can encompass a number of issues, to be taken by the top management of the Port Trust. Issues covered by the strategy are for instance:

- Whether or not competitively auction a concession;
- Whether or not tendering with prequalification is followed;
- Set a time frame for the concession process;
- How to structure the Project Organisation;
- To establish the required Project Organisation.

Project organisation
A solid project organisation is of paramount importance. In order to arrive at a satisfactory concession process within an acceptable time frame the set up of a project organisation is recommended consisting of a Concession Project Team and a Steering Committee with representatives of relevant entities.
The products of the Project Team are among others planning documents, tender documents and concession contract(s)

Project Planning
The set up of the project planning is the first task of the Concession Project Team. It should contain in detail the activities and milestones of the various steps in the process.

A summary of activities as a guideline for a planning is as follows, assuming that the tendering with prequalification recommendation is followed.

- Prepare publication of invitation to express interest in rendering Port Services indicating the port, the type of service required, the competent authority, the address to submit, the latest date to submit and a date for a site visit;
- Prepare the Prequalification Tender Letter for rendering Port Services and other tender documents;
- Decision of Steering Committee to proceed;
- Publication of Invitation to express interest in national and international media;
- Send prequalification tender documents to candidate bidders that have timely submitted expression of interest;
- Escort site visits of candidate bidders;
- Evaluate data received timely and in accordance with the instructions to candidate bidders;
- Prepare prequalification evaluation report recommending qualified bidders;
- Decision of Steering Committee to proceed.

- Send result of evaluation to all the candidate bidders;
- Prepare Request for Quotation and other tender documents;
- Send Request for Quotation and tender documents to qualified bidders;
- Escort site visits and tender meeting(s) for bidders;
- Collect verbal and written questions and answers during site visit and dispatch to all bidders;
- Open and evaluate technical proposals received timely and in accordance with instructions etc;
- Make evaluation report;
- Decision of Steering Committee to proceed.

- Open and evaluate financial proposals;
- Prepare evaluation report and recommend best candidate;
- Decision of Steering Committee to finalise contract;
- Contract negotiations with the best candidate;
- Prepare letter for all bidders after successful conclusion;
- Decision of Steering Committee to sign contract;

- Identify and define performance indicators for required services;
- Identify and define service-monitoring requirements;
- Set up department with monitoring responsibility;
- Install monitoring department;
- Sign contract;
- Give discharge to the project organisation;
- Monitor concessioned service.

Tendering
In this paragraph a guideline for the contents of tender documents is provided.

Prequalification
The prequalification tender contains at least:
- A prequalification Tender Letter, submitting the prequalification tender documents, requesting to submit qualification data and a statement of (unconditioned) compliance with the tender procedure;
- A concise description of the required services and detailed information on the current situation;
- A description of the tendering procedures;
- A description of the project organisation of the Port Trust;

- A list of data required from the candidate concessionaire, e.g., a relevant track record of the candidate, their number of personnel and qualifications, balance-sheets, types of insurances;
- Instructions to candidate bidders regarding the submission of the required data, with the latest date for submission and the address, with instructions how to submit, the opportunity for a site survey, the language used, etc.;
- The selection criteria, mapped on the above-mentioned data and the quality of the written presentation.

The data to be submitted by the candidate suppliers of the services should at least make clear their:
- Professional qualifications, both of company and key personnel;
- Financial circumstances and capacities;
- Insurance coverage and extent of coverage;
- Experience in the field of Port Services required;
- Current involvement in Port Services;
- Agreement with the tender procedure and the evaluation criteria.

Tendering for the concession

After the tender documents have been completed and agreed upon and the qualified candidates have been identified, the tender documents can be sent to these candidates. The tender documents include:
- A Request For Quotation (RFQ), submitting the tender documents and requiring a statement of (unconditioned) agreement with the tender procedures and evaluation criteria;
- A request for a *technical proposal*, mapped on the pro-forma concession agreement, describing in full detail;
- How the qualified bidder is to carry out the required Port Services;
- What his personnel requirements are and how he will deal with the current work force in the Port;
- How he deals with the relevant legislation, e.g. the Port Law, Labour Law, Social Security and Labour Safety legislation, the national and international rules and regulations regarding safety of port operations, the safe use of port equipment and protection of the port environment;
- A Contingency Plan for fires and explosions on board of ships and the port area, the occurrence of a natural disaster, etc.;
- A Quality Assurance plan for operations;
- A report on required infrastructure, superstructure and equipment;
- A Maintenance Plan for superstructure and equipment, aiming at transferring the equipment and superstructure back to the Port Trust in an operationally adequate condition at the termination of the concession, enabling the Port Trust to extend or to auction the concession at the then prevailing circumstances.
- The possible use of subcontractors;
- The RFQ furthermore requires a separate *financial proposal*, covering purchase or lease of equipment and superstructure, the lease of the infrastructure, throughput guarantee, royalties and a transparent cost-based tariff structure.

The tender documents furthermore comprise:
- The tender evaluation criteria;
- The pro-forma concession agreement with the concession conditions;
- The instructions to bidders regarding the submission of their bid, containing the latest date for submission, the address, how to submit, his liaison officer, the possibility to make an appointment for a site survey. In case there are several qualified bidders, a day for a site survey and a meeting to ask questions

regarding the tender for al the qualified bidders can be fixed in the Instructions to bidders.

Awarding, management, evaluation

The key decision to award the contract can be taken when:

- The winning concessionaire has been identified clearly and unambiguously, based on the proposal and the subsequent discussions and/or negotiations;
- The department of the Port Trust charged with the monitoring has been identified/installed.

CONCESSION CONDITIONS

Hereafter a number of items to include in the concession agreement, to be used as a guideline, are presented:

- The size of the service package;
- Duration;
- Termination;
- Tariff control;
- Ownership of assets;
- Safety;
- Commercial Risk;
- Applicable Law.

Check list for a Pro-forma Concession agreement

The Pro-forma agreement, to be annexed to the RFQ, automatically becomes the Concession Agreement upon signing by both parties. It will have the following structure, to be used as a guideline.

- *Definitions.* All expressions and abbreviations used in the Agreement;
- *Scope.* The Concessionaire will render to Port Users the Port Services as defined in the agreement in <location> under the terms and conditions as defined in this agreement;
- *Parties.* The Port Trust, with <location telephone, address, etc> the concessionaire with <organisation name, telephone, address, etc.>;
- *Representation*. Communication on agreement daily matters only via the explicitly mentioned representatives of the parties;
- *Change Management.* In cases of change or update of specifications of the agreement a change management procedure will be followed, resulting in a contract revision sheet, to be annexed to the Agreement;
- *The infrastructure placed at the disposal of the concessionaire*. In an annex a recent status report;
- *General conditions.* These need to be included in the Agreement as a number of clauses;
- *Arbitration*. In matters of dispute concerning interpretation or complaints concerning the services rendered, Parties will settle the dispute by mutual negotiation, if necessary assisted by specialists appointed by both Parties. Costs for appointing specialists will be divided between Parties;
- *Services (Responsibilities and tasks).* To be specified. When the Parties sign the Agreement, the responsibilities and tasks as provided in the Technical Proposal of the Concessionaire with amendments resulting from the previous contract negotiations, are to be annexed to the Agreement;
- *Access to premises* of authorised personnel of Port Trust to the infrastructure and superstructure put at disposal of the concessionaire under the force of the Agreement, to exercise its monitoring function must be possible at any time;
- *Service Levels.* Office Hours, working hours, shifts;

- *Superstructure and equipment*. Describing the infrastructure, which renders to the required services;
- *Other obligations*. Obligations related to the rendering of the Port Service, e.g. streamlining of the port work force, maintenance;
- *Costs and Tariffs* To be specified. When the Parties sign the Agreement, the responsibilities and tasks as provided in the Financial Proposal of the Concessionaire with amendments resulting from the previous contract negotiations, are annexed to the Agreement;
- Payment schedule;
- Starting date of the Agreement;
- *Signature.* For the concessionaire, name function date; For the Port Trust, name function, date.

Annex 2 Projects Major Ports in India

Projects Kandla

RS Crores

Kandla	Timing	Investment costs				WACC	IRR (project)
		Total	Port Trust	Private	GOI		
Client related investment projects							
Development of 12th Cargo berth and setting up of Container Terminal at Kandla	2007	330	150	180			
Development of Container Terminal 2	2013	370	90	280		11%	40%
Development of Container Freight Station 1	2012	65		65		11%	13%
Development of dedicated Coal Berth at Tuna	2013	110		110		11%	16%
Development of Port Based Special Economic Zone (SEZ)	2010	3.984		3.984		9%	10%
Development of 13th to 16th multi caorgo berths at Kandla	2009	404		404		11%	13%
Expansion of capacity of liquid bulk cargo jetty	2009						
Public Infrastructure Related Investment Projects							
Development of Spur for Dedicated Freight Corridor	2010	234	234				18%
Single Level Car Parking (Ro-Ro)	2010	7,2	7,2				35%
Dredging the Sogal Channel	2007-2014	186	186				
Modification of Bunder basin for barge handling facility	2007	10	10				
Extension of Railway network in the rear of back up area from berth nos. 11 to 16	2008	17,4	17,4				
Providing Railway network in newly added cargo jetty and proposed SEZ	2008	25	25				
Road Over Bridges	2008	20	20				
Cargo Gates	2010	0,6	0,6				
Total investments in fixed assets		**5.763**	**740**	**5.023**			
Correction investments for 7 year period			**140-**				
Total investments in fixed assets in financial model			**600**				

Projects Mumbai

RS Crores

Mumbai	Timing	Investment costs Total	Port Trust	Private	GOI	WACC	IRR MbPT	NPV MbPT	IRR BOT	NPV BOT
Client related investments										
Development of Offshore Container Terminal:						13,04%	9,32%	11,20	22,35%	711
Dredging	2007-08 to 2010-11	259	259							
Filling and leveling of Prince's and Victoria docks	2007-08 to 2010-11	74	74							
Navigational aids	2007-08 to 2010-11	4	4							
Railway siding	2007-08 to 2010-11	4	4							
Implementation of the EMP recommended bij the MoEF	2007-08 to 2010-11	2	2							
Two Berths	2007-08 to 2010-11	167		167						
Approach Trestle	2007-08 to 2010-11	89		89						
Container stacking yard	2007-08 to 2010-11	163		163						
Cargo handling equipment - 1st stage	2007-08 to 2010-11	284		284						
Vehicles - 1st stage	2007-08 to 2010-11	15		15						
Electrical equipment	2007-08 to 2010-11	12		12						
Civil facilities	2007-08 to 2010-11	21		21						
Container handling equipments	2012-13	134		134						
Vehicles	2012-13	8		8						
Container Freight Stations (Large CFS)						13,04%			20,58%	68
Site development	2009-10	2	2							
External developments - compound wall, gate building	2009-10	2		2						
Warehouse of 5 ha	2009-10	41		41						
Container yard of 16,5 ha	2009-10	27		27						
Other core building facilities - truck parking, office, plumbing	2009-10	2		2						
Other civil works - canteen, fire fighting facilities	2009-10	1		1						
Electrical equipment	2009-10	1		1						
Furnitures and fixtures	2009-10	1		1						
Vehicles	2009-10	0		0						
Plant and Machinery	2009-10	7		7						
Preliminary and Pre-operative expenses	2009-10	5		5						
Contingencies @ 2,5% project cost	2009-10	2		2						
Fifth Oil Berth at Jawahar Dweep									23,79%	195
Dredging and navigational aids	2009-10 to 2010-11	80	80							
Investments private operator	2009-10 to 2010-11	132		132						
Distriparks							49,78%	50,6	14,11%	22
Land development cost	2009-10	23	23							
Construction cost of Industrial Buildings and Storage Buildings	2009-10	226		226						
Empty Stacking Yards									11,09%	negative
Private investments	2009-10	5		5						
Cruise Terminals and related facilities									14.10%	41
Investments in basic infrastructure	2009-12	134	35	99						
Investments for Core Terminal and allied facilities	2009-12	254	66	188						
Development on the Western Waterfront										
Cost of Marina development	2006-11	22	22			9%	24,38%	43,41		
Convention Centre		140								
Public Related Investments										
Phase I										
Redevelopment of 18 to 21 ID Harbour Wall berths. Upgradation of the berths and deepeming of the harbour wall to handle deep drafted General Cargo ships		259								
Construction of 2nd berth for handling chemicals / specialised grade of POL at New Pir Pau		90								
Procurement of 2 Nos 32 tonne Bollard Pull Harbour Tugs		25								
Replacement of Caisson Gate at HDD		13								
Replcement of 3 Dock by 2 Dock Tugs		19								
Procurement of 10 Nos 6 tonne ELL Wharf Cranes		30								
Rail Connectivity between Wadala and Kurla		126								
Road improvements within MbPT Estate		35								
Road improvements outside MbPT Estate - Wadala Mahul to Truck Terminus Link		15								
Road improvements outside MbPT Estate - Anik Panjarepole Link		152								
Procurement of 2 Nos QGC's		63								
Procurement of 3 Nos RTG's		22								
Phase II										
Capital Dredging for Deepening approach channel to 5th Oil berth at Jawahar Dweep		50								
Capital Dredging for Deepening approach channel to 2nd Chemical Berth at Pir Pau		138								
Redevelopment of BPX and BPS Berths		150								
Development of Coastal Shipping		50								
Second Chemical Berth	2008-10	107	107				17,37%	93		
3rd Chemical Berth vs Double banking in 2nd Chemical Berth	> 2014									
Multi-level Car Parking Facility	2010-11	201	201				23,91%	504		
Redevelopment of the Outer Harbour Wall at Indira Docks	2008-10	358	358				18,30%	651		
Development of Bunder Areas for Coastal Shipping and others	2010-13	44	44							
Re-engineering of Indira Docks	na 2014									
Upgradation of Apollo Bunder	2008-09	5	5							
General Warehousing and Storage	2012-13	4	4							
Development at Mahim Bunder	2008-09	0	0							
Bird Observatory at Sewri Fort	2009-10	1	1							
Total investments in fixed assets		**4.300**	**1.290**	**1.634**						
Correction investments for 7 year period			**26-**							
Normal costs of events			**658**							
Proposed projects without cash flows (as in financial model)			**439**							
Planned MbPT-projects without Cash Flows (as in financial model)			**535**							
Total investments in fixed assets in financial model			**2.896**							

Projects JNPT

RS Crores

JNPT	Timing	Investment costs				WACC	IRR (project)	NPV
		Total	Port Trust	Private	GOI			
Client related investment projects								
Development of 32 Hectares of land for CFS	2007-08	212	114,2	98				
330 m Extension of existing berth towards NSICT	2008-09	531		531		13%	24%	470
Development of 50 Hectares of land for empty depot operations	2008-09	235	185	50				
Port Based Logistics and FTZ (lessee)	2009-10	1.700		1.700		13%	23%	137
Port Based Logistics and FTZ (port trust)	2009-10	722	722			9%	15%	348
Development of the first fase of 4th Container Terminal	2010-11	3.035		3.035		13%	14%	280
Marine Chemical Terminal - fase 1	2010-11	88		88		13%	20%	56
Development of 40 Hectares of land for empty depot operations	2012-13	227	173	54				
Development of 56 Hectares of Land for CFS Operations	2012-13	468	243	225				
Public investment projects								
Common user pipelines	2007-08	174,7	174,7					
Laning of SH - 54	2007-08	3.580	1.000	2.580				
Grade separators at Karal and Guvan Phata	2008-09	800	400	400				
Increase shallow berth moves to 16 moves per hour	2008-09	8	7,5					
Additional link road	2009-10	1.680	475	1205				
Additional Evacution Road	2009-10	41	41					
Dronagiri link road	2009-10	26	26,3					
Dredging	2008-09	800	800					
Increase RMQC moves at JNPT to 24 moves per hour	2009-10	120	120					
Six Laning of NH4B	2010-11	450	50	400				
Additional road linking port and highways	2010-11	45	45					
4th container terminal link road	2010-11	33	33,3					
Reduction in vessel unoperational hours	2010-11	-						
Development of Sorting Yard	2010-11	356		356				
Increase RMGC Moves per hour	2013-14	-						
Total investments in fixed assets		**15.332**	**4.610**	**10.722**	**-**			
Correction investments for 7 year period			**231-**					
Total investments in fixed assets in financial model			**4.379**					

Projects Mormugao

RS Crores

Mormugoa	Investment costs				
	Total	Trust (IR)	(Debt)	Private	HAI
Repair and strenghthening of breakwater	27	11	16		
Deepening the approach channel and berth no. 9	65				65
Increasing the Iron ore handling capacity	316	126	190		
Developing Vasco Bay to handle the liquid bulk and other non cargo vessels	90	36	54		
Construction of new berth no. 7	140			140	
Increasing the capacity of handling miscellaneous commodities	15	6	9		
Improving the rail and road connectivity between hinterland in Karnataka and Goa	2.029				2.029
Improving the road and rail connectivity within the port premises	31	12	18		
Computerization of the port	4	2	3		
Miscellaneous	71	71			
Total investments in fixed assets	**2.788**	**264**	**290**	**140**	**2.094**

Projects New Mangalore

RS Crores

New Mangalore	Timing	Investment costs				WACC	IRR BOT	NPV BOT
		Total	Port Trust	Private	GOI			
Road connect to port	2007-08	895	10	885				
Development of port based SEZ	2007-08	5	1	4				
Mechanised Iron Ore handling berth 14	2008-09	197	-	197		8%	32%	261
Harbour crane (for bulk cargoes)	2008-09	30	30	-				
Harbour tug No 1	2008-09	30	30	-				
Development of bunker facilities	2008-09	10	-	10				
Development of coal berth 15	2009-10	194	-	194		8%	22%	270
POL berth at oil dock, berth 13	2009-10	54	54	-		8%	29%	130
Development marshalling yard	2009-10	40	10	30				
Container terminal to 100k TEU	2009-10	32	32			8%	45%	64
IT	2009-10	4	4					
Pilot Launch	2009-10	5	5					
Improvement internal roads	2010-11	50	50					
Environment	2010-11	3	3					
Multi purpose berth No 16	2010-11	50	50					
KIOCL Berth nr 8 from 13 to 14 m	2011-12	18	18					
Harbour tug No 2	2011-12	20	20					
Bulk handling (ore/coal) Western dock, berth 17	2013-14	50	50					
Total investments in fixed assets		**1.686**	**367**	**1.320**	**-**			

Projects Cochin

RS Crores

Cochin	Timing	Investment costs				WACC	IRR (project)	NPV
		Total	Port Trust	Private	GOI			
Vallarpadam International Container Terminal (VICT)	2007							
Single Buoy Mooring Facility for crude Oil Import (SBM)	2007							
LNG Terminal	2009							
LPG Terminal	2008							
Bunkering Terminal (two phases)	2007-09	55		55			21%	25
	2017-19	38		38				
International Cruise Terminal	2008-10	55		55			14%	36
Distribution Park	2007-08	36		36			22%	26,82
Business District	2006-07	149		149			18%	120,31
	2009-10	133		133				
Upgradation of Willingdon Island	2007-08	15	15				4%	-26,18
	2010-11	60	60					
Capital Dredging	2010	481	481					
Total investments in fixed assets		**1.021**	**556**	**465**	**-**			

Projects Tuticorin

RS Crores

Tuticorin	Timing	Investment costs				IRR
		Total	Port Trust	Private	GOI	
Cargo berth No 9	2007-09	40	40			9%
Shallow Berth - 3 Nos	2007-09	30	30			15%
North Cargo Berths	2007-11	60	60			14%
Dredging	2007-09	450	450			
Upgradation of CJ-II	2007-08	7	7			23%
Conversion of CB8 to CT8 (Rs Crores 30 in 2006-07)	2006-09	150		150		10%
Outer Harbour - Phase I	2009-14	1788	1638	150		12%
Outer Harbour - ICJ (Rs Crores 24 in 2014-15)	2013-15	36	18	18		12%
Provisions for investments	2012-13	75	75			
Total investments in fixed assets		**2.636**	**2.318**	**318**		

Projects Chennai

RS Crores

Chennai	Timing	Investment costs				IRR	NPV
		Total	Port Trust	Private	GOI		
Multilevel Car Parking and Cruise Terminal	2007-08	133	133			15,31%	41,54
Dedicated Elevated Corridor	2007-08	40	20		20		
Ennore Manali Expressway	2007-08	4	4				
Various	2007-12	191	191				
Development of container Terminal 2	2008-09	100	100				
Converting Tondiarpet Housing Colonyinto Off-dock Container Stacking Facility	2012-13	50	5	45		17,40%	2,43
Total investments in fixed assets		**518**	**453**	**45**	**20**		

Projects Ennore

RS Crores

Ennore	Timing	Investment costs				WACC	IRR	NPV
		Total	Port Trust	Private	GOI			
Private Investments								
Existing Coal Berths (TNEB Coal)	2013-14	200		200				
Common-user Coal Terminal	2007-09	400		400				
Common-user Iron Ore Terminal	2007-09	480		480				
Marine Liquid Terminal	2006-08	196		196				
Container Terminal	2008-10	1.300		1.300		12%	27,30%	867
Public Investments								
Capital Dredging phase 1	2007-08 to 2010-11		90					
Capital Dredging phase 2	2007-08 to 2010-11		150					
Capital Dredging phase 3	2007-08 to 2010-11		170					
Road Connectivity	2007-08 to 2010-11		180					
Rail connectivity to coal, iron ore, and container stackyards	2007-08 to 2009-10		63					
Miscellaneous investments	2007-08 to 2009-10		45					
Equity contribution to the SPV of Puttur-Attipattu new rail line			50					
Total investments in fixed assets		**2.576**	**748**	**2.576**				

Projects Visakhapatnam

RS Crores

Visakhapatnam	Timing	Investment costs				WACC	IRR (project)	NPV
		Total	Port Trust	Private	GOI			
Mobile Cranes 2*100t	2007	45		45				
Mechanisation export facility WQ1/2 (VPT 23)	2008	106	12	94		8%	20%	102
Construction WQ-7	2008	8		8				
Replacement Equipment IO Berths	2008	39	39					
Deepening Entrance Channel and Inner Basin to 12,5 m	2008	40		40				
Strengthening W. Quays to 12,5 m	2008	47	47					
Mechanisation General Cargo Berth	2009	237	65	172		8%	12%	70
SBM facility for the handling of crude by VLCC	2009	540		540				
Replacement tugs	2009	40	40					
New tugs 75T BP	2009	90	90					
Construction WQ 6	2009	45		45				
East Docks, South Side	2009	119	30	89				
Construction EQ 10	2009	35		35				
Mechanised facilities coal handling East Docks South	2009	60		60				
Liquids lines / Loading arms LPG Jetty	2009	23	23					
Installation shiploader Alumina WQ7	2010	30		30				
Construction WQ 8	2010	50	50					
Procurement barges and launches	2010	6	6					
Replacement 2 locos 1430 HP & 1 loco 3100 HP	2010	34	34					
Extension Container Terminal	2011	120		120				
Upgrading OR1-2	2011	50		50				
Road	2011	229	229					
Other works	2011	132	62	70				
Rail	2011	129	129					
Upgrading Iron Ore Jetty for 200.000 DWT (lengthening)	2012	50	50	-		8%	18%	37
Environmental	2012	45	45					
Residual costs on VPT 4	2012	145	145					
Deepening Entrance Channel and Inner Basin to 14 m	2014	150		150		8%	< 0%	198-
Strengthening E. Quays to 14 m	2014	120		120				
Mechanised import facility EQ1-3	2015		2	74				
East Docks, North Side	2015	89		89				
Total investments in fixed assets until 2014		**2.763**	**1.096**	**1.668**	-			
Total investments in fixed assets		**2.852**	**1.098**	**1.831**				

Projects Paradip

RS Crores

Paradip	Timing	Investment costs				WACC	IRR	NPV
		Total	Port Trust	Private	GOI			
Deepening of the Channel	2008-09	716	373	343		15%	11%	451
Deep draft Iron Ore Berth Phase 1	2008-11	448	116	332		15%	16%	516
Deep draft Coking Coal Phase 1	2008-11	356	107	249		15%	17%	42
Deep draft Non-Coking Coal Phase 1	2008-11	218	83	135		15%	19%	50
Container Terminal Phase 1 & 2	2011-12	697	146	551		15%	16%	20
Fertilizer Terminal (dredging)	2014	41	12	29		15%	20%	20
Other investment provision	2007-14	360	360					
Iron Ore Berth Phase 2	> 2018	504		504		15%	15%	190
Coking Coal Berth Phase 2	> 2018	270		270		15%	15%	1
Total investments in fixed assets until 2014		**2.836**	**1.197**	**1.639**				
Total investments in fixed assets		**3.610**	**1.197**	**2.413**	-			

Projects Kolkata

RS Crores

Kolkata	Timing	Investment costs				Debt	WACC	IRR
		Total	Port Trust	Private	GOI			
HDC Ongoing projects								
River Regulaory (RR) Measures for improvement of Draft in Hooghly Estuary		421			421			
Construction of Multipurpose berth (No. 2)	2006-07	47	47					
Construction of Multipurpose berth (No. 13)	2006-07	40	40					
Construction of two Holding Berths		20	20					
Procurement of 2 RMQs for container handling		50	50					
Procurement of 4RTGCs for container handling		24	24					
Procurement of 2 nos. Stacker-cum-reclaimer		25	25					
Development of Road Infrastructure		30	30					
Improvement of Back Up Area with Railway connectivity		25	25					
Development of additional storage area		50	50					
Augmentation of railway siding and allied facilities in Haldia dock complex		24	24					
HDC New Projects								
Acquisition of new equipment		100		100				
Dry Bulk Capacity Enhancement (berth 2 and 13)		48						
Up-Grading Handling Capacity of Existing Berths		105		105				
New Riverine Jeties - 2 nos	2007-08	48	48					
	2008-09	99	99				16%	25,61%
KDS Ongoing projects								
Pocurement/Replacement/Refurbishment of Cargo of handling equipment for handling Containers		23	23					
Replacement/Refurbishment of various Cargo of handling equipment for handling Break Bulk		24	24					
Construction of Pilotage facilities		14	14					
Modernization/replacement for Port Craft viz. Grab Dredger & Tugs		42	12			30		
Replacement of SD Subarnarekha		130			130			
Development of infrastructure for storage of break bulk		17	17					
Up-gradation of Railway Track at KDS to handle break bulk		9	9					
Development of infrastructure to store break bulk materials		19	19					
Development of Energy Education/Environmental Awareness Park		10	0			9,9		
Commercial utilization of Mechanical Engineering Workshop Facilities		15	0			15		
KDC New Projects								
3 New Berths at Diamond Harbour (BOT 313, rest PT?)	2006-07	16					10,38%	15,96%
	2007-08	132						
	2008-09	167						
	2009-10	46						
Floating Terminals at Sagar/Sandheads		350	5	345				
3 Riverine Jetties at Saugor (BOT 665, 35 PT)	2009-10	140					10,38%	14,07%
	2010-11	280						
	2011-12	280						
Yard Development at NSD		50		50				
1-30 T capacity ELL Crane		8		8				
Total investments in fixed assets		**2.925**	**603**	**608**	**551**	**54**		
Correction investments for 7 year period			**291**					
Total investments in fixed assets in financial model			**894**					

Annex 3 Projected Profit and Loss account 12 major Ports

In Rs Crores	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2025-26
Revenue								
Port dues	621	688	741	860	910	975	1.050	2.026
Other dues	943	1.036	1.107	1.302	1.393	1.505	1.614	3.020
Stevedoring revenu	1.083	1.181	1.154	1.134	1.185	1.289	1.322	1.964
Storage	276	298	310	275	297	301	313	453
Wharf handling	1.203	1.360	1.321	1.339	1.416	1.454	1.550	2.293
Concession fee	598	813	1.119	1.574	1.732	1.933	2.146	5.064
Other operational income	722	870	1.024	1.106	1.175	1.291	1.380	2.245
Total operating revenue	**5.446**	**6.246**	**6.775**	**7.589**	**8.108**	**8.747**	**9.375**	**17.066**
Expenses								
Salaries	1.466	1.503	1.476	1.529	1.542	1.581	1.617	2.489
Social charges and pension premiums	809	839	765	790	723	567	599	611
Running costs	1.096	1.246	1.043	1.264	1.417	1.587	1.720	3.484
Administrative costs	206	224	231	254	261	279	294	555
Other costs	153	163	245	211	178	195	210	430
Total operating costs	**3.729**	**3.975**	**3.761**	**4.047**	**4.121**	**4.209**	**4.441**	**7.568**
Operational net earnings before DIT	1.717	2.270	3.014	3.542	3.987	4.537	4.934	9.497
Other income	949	1.006	1.060	1.130	1.237	1.406	1.544	3.970
Net earnings before DIT	2.666	3.276	4.075	4.672	5.224	5.943	6.478	13.467
depreciation	369	437	546	593	629	692	699	1.208
Net earnings before it	2.298	2.839	3.529	4.079	4.595	5.251	5.779	12.259
Interest	-169	-220	-274	-262	-297	-348	-308	-107
Net earnings before tax	2.129	2.619	3.255	3.817	4.297	4.904	5.470	12.151
Tax	635	747	983	1.084	1.186	1.362	1.520	3.773
Net earnings	**1.494**	**1.872**	**2.272**	**2.733**	**3.112**	**3.542**	**3.950**	**8.378**

Annex 4 Benchmarks

Benchmarks as provided in this annex are obtained from the Final Report Development of business Plan for New Mangalore Port Trust.

5.2.2 Benchmarks for cargo handling

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 maneuvering 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 maneuver 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, North America and Asia.

Table 5-4 Container handling productivity (1)

Major North European Terminals			
Port / Terminal	Container Gantries TEUs per unit	Yard Area TEUs per hectare	Berth Length TEUs per metre
Primary Terminals	127,280	16,809	963
Secondary Terminals	117,321	16,201	703
All Terminals	124,390	16,638	874

Table 5-5 Container handling productivity (2)

Port	Terminal	Throughput Capacity (TEU / year)	Max. Throughput density (TEU/ha)	Max. Crane Productivity (TEU/Crane)	Max. Quay Productivity (TEU/m)
Hamburg	Eurogate	4,000,000	28,500	222,200	1,950
Bremen	Eurogate	6,000,000	29,850	222,200	1,975
Dalian	Dalian Terminals	3,400,000	30,900	188,900	1,350
Hong Kong	Hong Kong Terminals	12,550,000	67,470	199,200	2,050
Singapore	Singapore Terminals	24,000,000	56,740	172,700	1,920
Tuticorin	Tuticorin Container Terminal	450,000	45,000	150,000	1,220

Sources: Port of Hamburg (2007), Port of Bremen (2007), PSA (2007)

BREAK-BULK / GENERAL CARGO

Due to the wide range of products, ships, equipment, methods, assuming an average performance f all kinds of commodities and packaging makes little sense:

- Specialized traffic like paper, frozen meat, fish or fruits should be studied separate according to their packaging and to the type of ship and handling equipment (specialized not).
- Most commodities in big bags, pre-slung or pre-palletized loads, pallets, nets etc., can handled with a crane; a good organization should adapt to a rhythm of one cycle every 1.5 3 minutes (20 to 40 moves per hour), depending on the nature of the cargo, the unit weight the load, the ship's size and other factors as weather conditions, tide and swell, etc. Whenev the volume of goods to be handled is large enough to allow for a reasonable cost recovery additional equipment, special devices can be adapted to improve the unit load or to short the cycle.

Examples:

cements bags : 2 ton pallets built in the hold or on the apron: 40 ton/hour/crane. Pre-palletized bag 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 1 ton/hour/crane. Logs handled with slings; less than 100 ton/hour; only in daylight.

Table 5-6 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 ton 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 TRAFFIC

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 (100,000 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.

Ratios :

small bulk-carrier, 1,500 to 3,000 t shipment:	100/120 ton/hour per crane; 2 cranes operated in one day
from Panamax up to cape-size, 60,000 t shipment:	1 elevator and 2 cranes; 1,100 ton/hour, 15,000 to 18,000 ton/day; operated 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.

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. Same constraints, related to quality, safety and environment, may have to be taken into consideration.

Bulk-carriers ranging from the panamax to the cape-size: throughput: up to 15,000 to 20,000 ton/day. Examples of terminal handling:

EECV in Rotterdam unloading of coal at 3000 ton/hour (one of the largest continuous unloaders in the world. Total unloaded in 2006 – 4.1 million ton.

EMO Bulk Terminal in the Port of Rotterdam is by far Europe's most important dry bulk terminal. Eac year, about 35 million ton 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 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 wit 1,800 ton/hour with two gantry cranes. Total throughput of 6 million ton per year.

Reijka, Croatia, Unloading of coal 2,000 ton/hr and unloading or iron-ore 3,000 ton/hr. Total throughpu 2 million ton per year.

New developments: iron ore loading 8,000 ton /hour.

LIQUID BULK TRAFFIC

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 product Most liquid carriers are operated within one day, whatever the size.

Throughput: 300 to 1,000 cu m /hour, up to 10,000 cu m /hour and more for very large tankers.

Table 5-7 Pump Capacity of 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