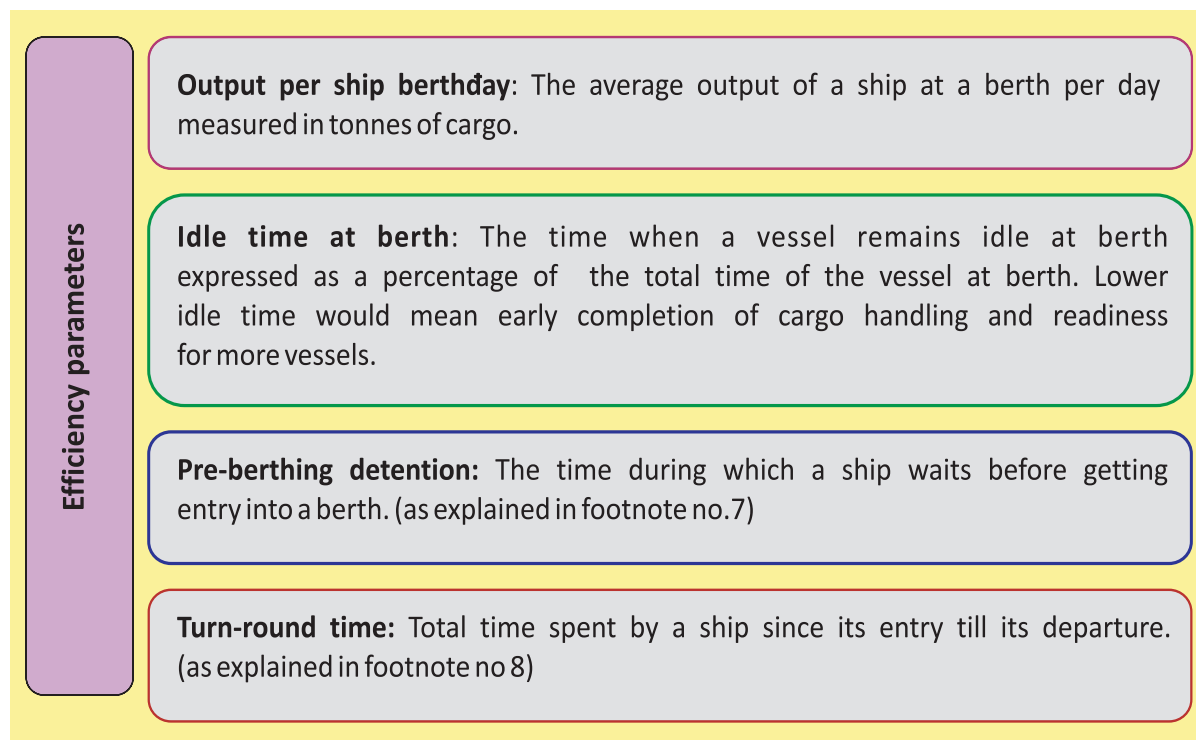


5 Performance indicators

5.1 Performance Indicators of Ports

Operational efficiency at ports is determined primarily by the following four efficiency parameters:



Every year, each major port enters into a MoU with the Ministry, in which targeted efficiency parameters are agreed upon. The efficiency parameters for a year are fixed, taking into account a percentage increase over the average of the last three years and the traffic projections as communicated by the Ministry of Shipping. The Ministry had stipulated (April 2003) that these targets should not be lower than the actuals for the previous year. As the performance of a port in respect of the above parameters enhances its competitiveness, it is imperative that the targets are fixed in a manner that incentivises better performance.

5.2 Fixation of Targets

Audit observed significant deficiencies in the formulation and fixation of performance targets as discussed in the succeeding paragraphs.

5.2.1 Wide variations in targets

There were significant inter-port variations in respect of targeted efficiency parameters which were abnormally low in some cases. The variation in targets for output per ship berth day in 2008-09 in different ports for different categories of cargo, are shown in Figures 5.1, 5.2 and 5.3.

It can be seen that the targets for output per berth day at Tuticorin and Mormugao were very low compared to those of Cochin and Kandla in the case of liquid cargo. Similarly, for dry bulk cargo, the targets were low for Kolkata and Mumbai as compared to Mormugao and Paradip. Container targets were highest in Chennai, JNPT and Tuticorin.

Since the targets fixed by the Ministry were not based on the standard outputs of equipment and berths and remained a mere upgrade of the previous performances as already stated in Para 5.1, very low targets were set in some ports based on past achievements, which did not motivate them to achieve higher mechanisation levels and adopt better labour practices.

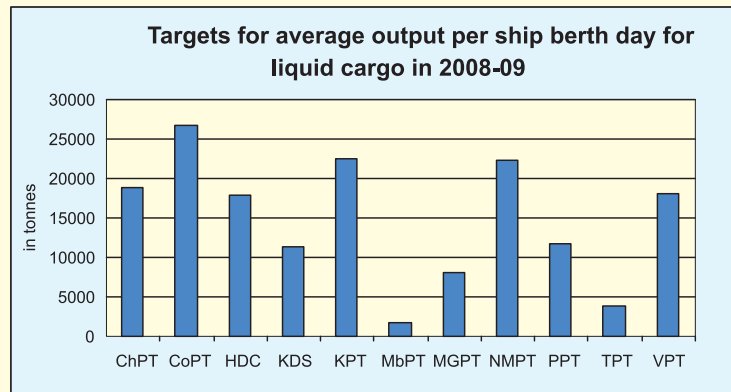


Fig 5.1

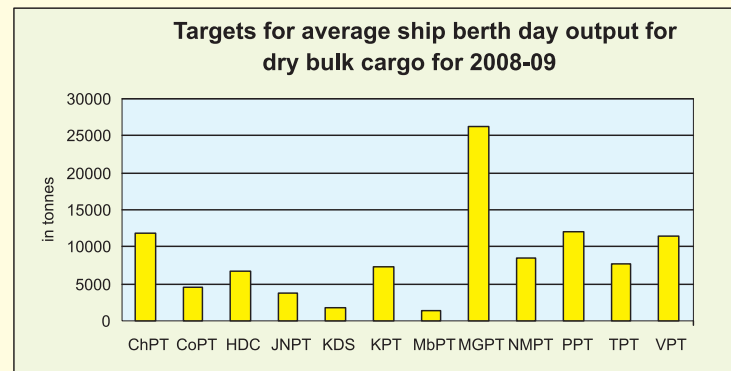


Fig 5.2

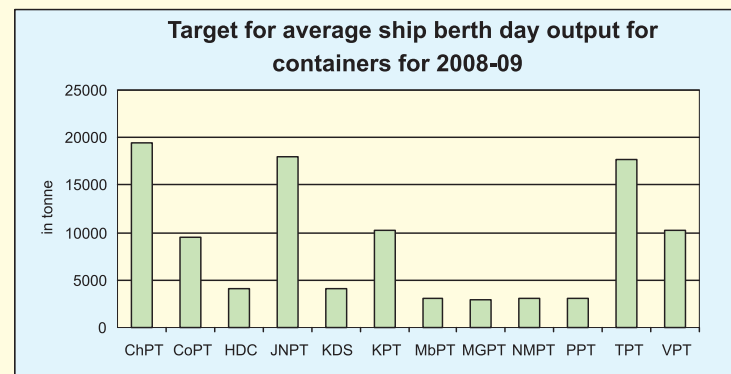


Fig 5.3

5.2.2 Formulation of high idle time

Audit observed that in seven out of the 11 ports, the Ministry had fixed idle time targets of more than 20 *per cent* of the time at berth as shown in Figure 5.4. At Haldia, the vessels were

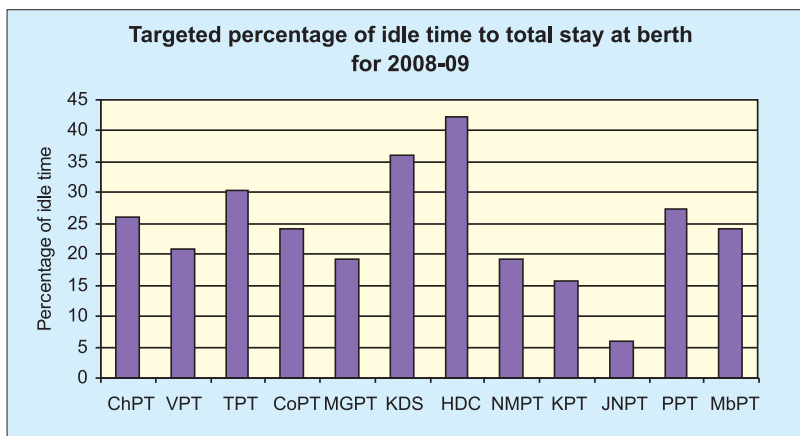


Fig 5.4

targeted to be idle at berths for 42 *per cent* of the time. As a result, vessels remained at berths for longer periods, resulting in increased waiting time for incoming vessels and congestion. It was noticed that despite having mechanised facilities for handling dry bulk cargo, the average PBD for a dry bulk vessel at Haldia was

4.24 days, out of which 2.21 days were on account of berths remaining occupied.

In the case of Mumbai port, the idle time at berths targeted continuously for the last three years was 25 *per cent*. The port Management stated (May 2009) that the high idle time was due to the long time taken for documentation and clearances, constituting 60 *per cent* of the idle time. Since the targets were based on past achievements, the idle time incurred for documentation was also factored into the targets. This indicated that the targets fixed by the Ministry were not realistic.

5.2.3 Low equipment utilisation target

Although the Ministry fixed norms of 90 *per cent* availability and 60 *per cent* utilisation for all equipment, these were adopted only by JNPT. In Mormugao and Kolkata, no specific targets for utilisation of equipment were prescribed in the MoUs. At all other ports, the targets for utilisation mentioned in the MoUs were below the prescribed norms for some of the categories of equipment. At Cochin and New Mangalore ports, the utilisation targets for wharf cranes were below 10 *per cent*. Mumbai port consistently adopted abnormally low targets for utilisation of equipment for the last three years as shown in Table 5.1.

Utilisation targets for Mumbai port (percentage)			
Type of equipment	2005-06	2006-07	2007-08
Wharf crane	17	17	17
Fork lift	20	20	18
Heavy duty fork lift	15	10	15
Quay gantry cranes	25	20	15
RTG crane	5	Not fixed	Not fixed
Reach stacker	10	10	Not fixed
Mobile crane	12	12	12

Table 5.1

The Ministry validated these low targets in the MoUs in disregard of the norms it had prescribed earlier. The low and easily achievable targets did not motivate the ports to adopt good practices like synchronization of maintenance schedules, proper inventory management and timely cargo aggregation for improving the utilisation of equipment.

5.2.4 Reduction in targets

In contravention of the Ministry's stipulation (April 2003) against lowering performance targets, several ports reduced the targets in their MoUs (Table 5.2).

Efficiency parameters	Instances where targets were lowered
Average ship berth day output	Target lowered in the case of VPT for liquid and JNPT for dry and break bulk cargo
Idle time at berth	Target lowered for JNPT
Pre-berthing detention	Target lowered for HDC, JNPT, NMPT and VPT
Turn-round time	Target lowered for Haldia and JNPT and VPT

Table 5.2

By validating the reduced targets, the Ministry's stipulation for non-reduction of performance targets was rendered largely ineffective.

5.2.5 Targets not based on facts

The performance parameters were not based on standard equipment or output of berths due to which there was no proper interrelationship between the parameters.

Audit observed the following in this regard:

- At Kolkata port, a two *per cent* increase in output per ship berth day was targeted to handle six *per cent* increase of cargo volumes, indicating a mismatch between the two.
- High availability levels of equipment presuppose proper maintenance arrangements like annual maintenance contracts, periodic overhauling and manning of in-house workshops, in the case of old ports. The cost of maintaining high availability levels of equipment is realised only if they are matched with proper utilisation. It was noticed in audit that the targeted availability of forklift trucks in Cochin was raised from 75 to 85 *per cent* in the targets set for 2008-09, whereas the target for utilisation was reduced from 50 to 29 *per cent*. Similarly, in the case of wharf cranes, the availability for 2008-09 was targeted at 90 *per cent* whereas the

utilisation target was reduced from nine to seven *per cent* at Cochin. At New Mangalore the targets for such cranes came down from seven to five *per cent* during 2006-08. Increasing the availability targets without increasing the scope of utilisation would have enhanced the maintenance costs without any added benefits.

5.3 Recording and Reporting of Performance

As per the international norms, TRT of a vessel is calculated from the time of arrival till its departure. It is expressed in days or hours. A diagrammatic representation of PBD and TRT is shown in Figure 5.5.

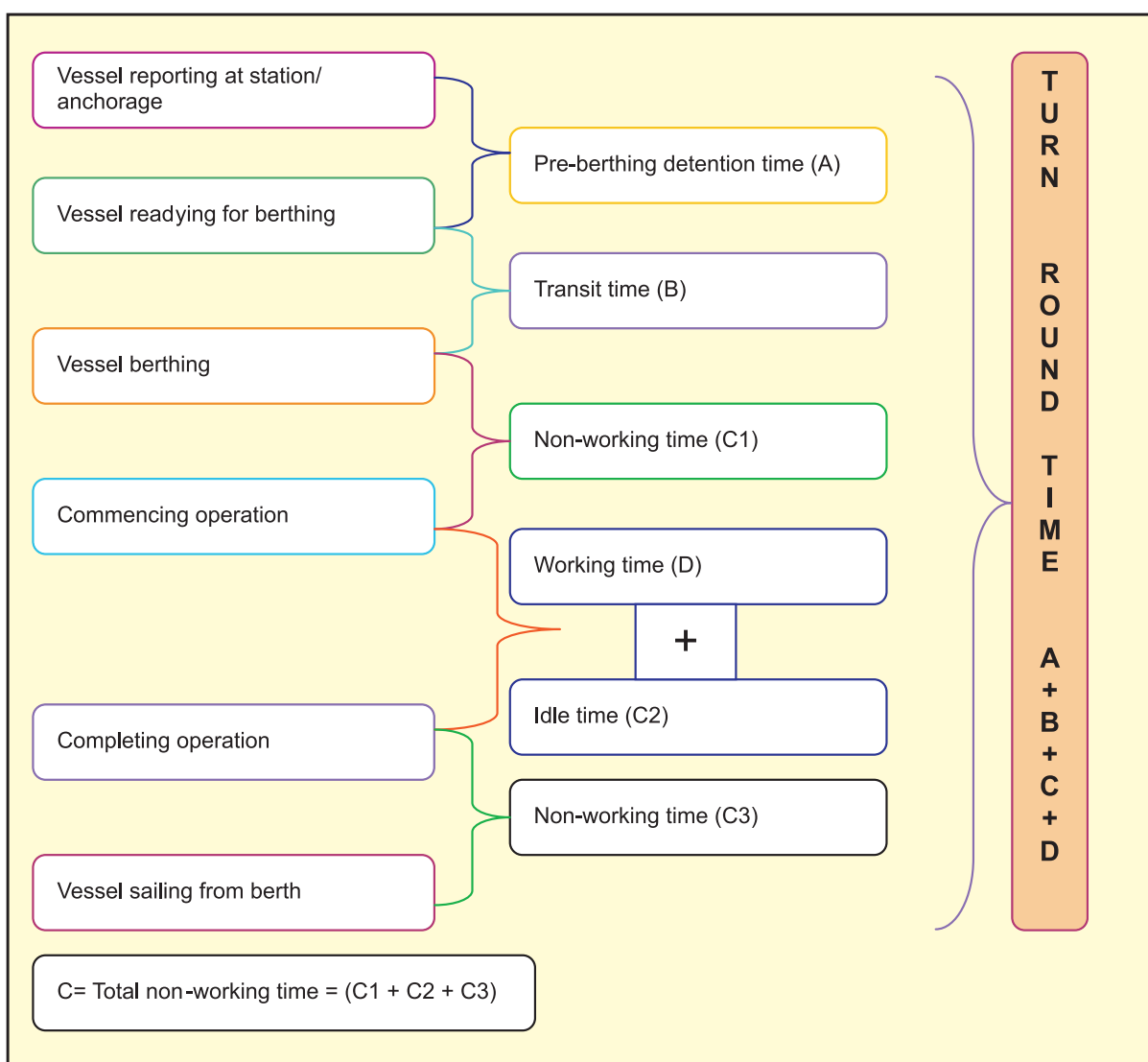


Fig 5.5 Diagrammatic representation of PBD and TRT

As shown in the diagram, the total TRT also includes PBD. In 2002, the Ministry instructed the ports to report TRT from the time when a vessel was ready for berthing till the time it left the berth and to exclude the waiting period on non-port account.

Similarly, PBD was to be reckoned from the time of arrival of a vessel at anchorage till the time of its readiness for berthing as shown above. The Indian Ports Association (IPA), an autonomous body under the Ministry of Shipping, communicated (July 2006) to all the ports, the need for segregating the factors affecting PBD into 'port account' and 'non-port account'. Factors such as requirement of berths, pilots etc, which were directly under the control of the port, were to be classified to be under 'port account' and factors like ship breakdown, weather constraints etc were to be clubbed under 'non-port account'.

In this regard, Audit observed the following;

- Chennai port reported average PBD of 0.96 hours per vessel in their Administrative Report for 2007-08, which represented the PBD only on 'port account' whereas the average PBD was 37.37 hours if delays on 'non-port account' were also included in the calculation. The other ports however, disclosed the total PBD in their reports.
- At Cochin, PBD due to non-availability of berths was recorded as PBD on 'port account' and all other factors for delays from the time of arrival of the vessels at the anchorage point up to the berthing time were classified under 'non-port account'. Even though the port accepted (May 2009) that the movement of hazardous cargo vessels was restricted during night hours due to poor lighting in the Mattancherry channel, no PBD on account of night navigation was recorded under 'port account'. After including 4646 hours of PBD, which was not classified, under 'port account', the PBD worked out to 7.65 hours as against 1.21 hours per vessel reported by the port for 2007-08.
- At JNPT, the vessel data in the Vessel Register of the Operations Department did not match the entries in the reports prepared by the Marine Department. It was noticed that the time of boarding of a vessel by a pilot was in some cases shown to be prior to the time of arrival of the vessel at anchorage. The entries in pilots' diaries showed that one pilot had handled more than two arriving vessels at the same time and one pilot had handled two vessels- one incoming vessel from anchorage to berth side and another outgoing vessel sailing from berth at the same time, which was not possible. Such inconsistencies in reporting of data were also noticed in the software used by the

port. The software for recording the vessel data required dates to be reported as MM/DD/YYYY, whereas sometimes dates were reported as DD/MM/YYYY, leaving scope for incorrect computation of PBD and TRT.

- JNPT computed the PBD of vessels by ignoring the period from the arrival of a ship at anchorage to the boarding of the pilots. This was not as per the IPA code and the actual PBD was, therefore, much higher than the reported one. The total PBD in respect of 1725 vessels that called at the port during 2007-08 was 39,947 hours. Against an average PBD of 4.22 hours and 2.17 hours computed by the port for two months viz; July and December 2007 respectively, the average PBD actually worked out to 9.18 hours and 7.40 hours as computed from the records of the Dock Master/Berthing Assistant.
- The PBD at Kandla was computed taking into account the dates and timings of arrival of vessels at the outer berth till the dates and timings of boarding of the pilots on the vessels. At Kandla, if a vessel was anchored at the mooring before final berthing due to any other reason, the waiting time in the mooring was also added to the PBD.
- Tuticorin port had two operational wings, viz Zone A and Zone B. Though the cargo handled at Zone B was included in the total cargo handling of the port, the performance indicators of Zone B were not included in their Administration Report. The port's Management replied (April 2009) that these indicators were not being maintained as Zone B handled small vessels/ barges only. Reply of the Management is not acceptable as there is no such evaluation by the Ministry for preparation of performance indicators. In the absence of this information, the reports did not reflect the complete picture of the performance of all the berths of the port.

As calculations of PBD and TRT were reckoned from the time when vessels were ready for berthing, the readiness was interpreted differently by different ports considering factors such as the time when the pilots boarded the vessels, pilot call time and starting time towards the berth, resulting in lack of uniform reporting of TRT amongst the ports. The method of computation of TRT also differed from international practices of computing TRT adopted by the United Nations Conference for Trade and Development (UNCTAD).

5.4 Achievement of PBD and TRT targets

Apart from the deficiencies in target fixation discussed above, most of the ports failed to achieve the efficiency targets for PBD and TRT as shown in Figures 5.6 and 5.7.

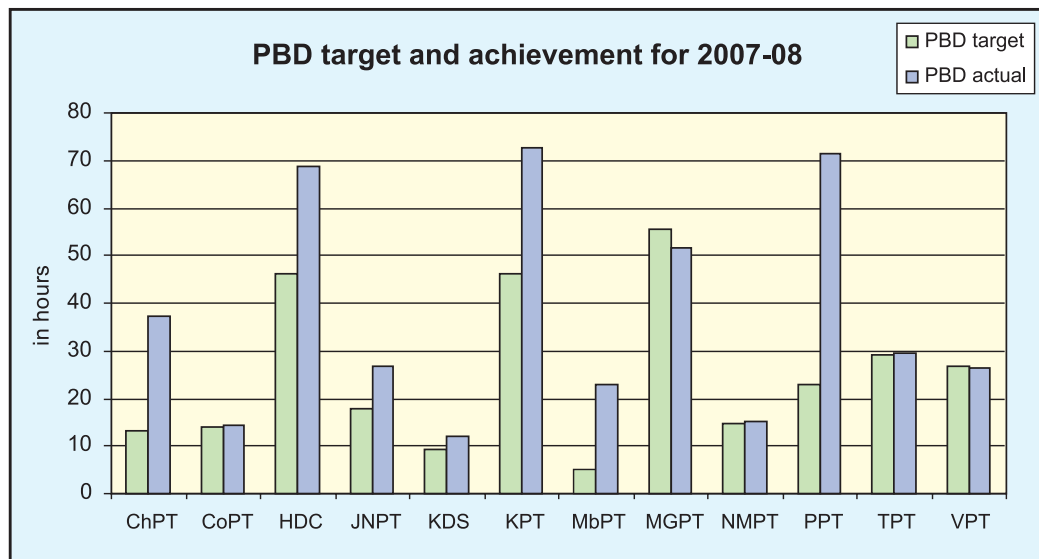


Fig 5.6

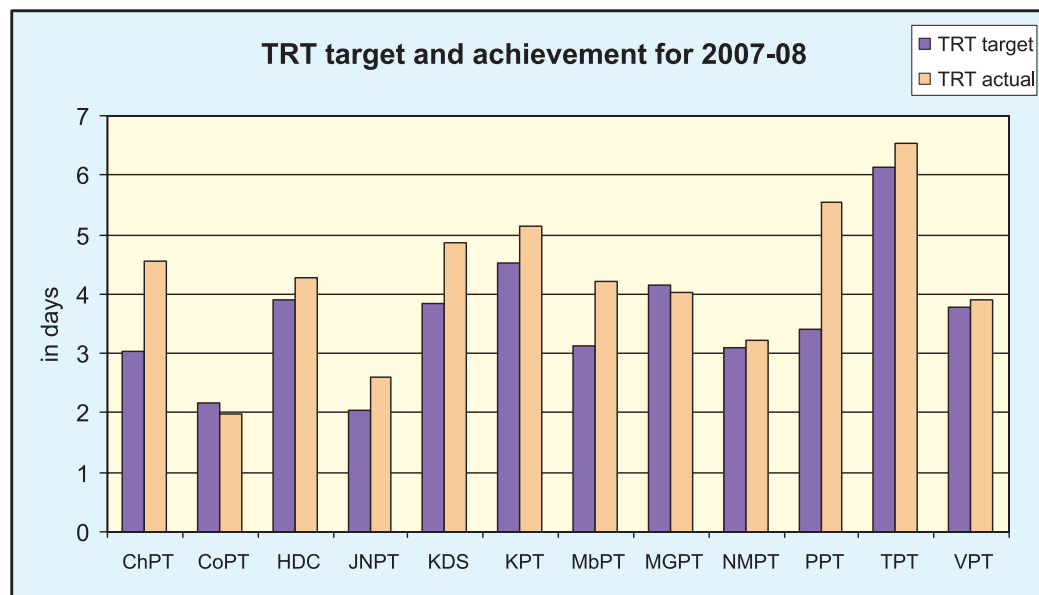


Fig 5.7

At Visakhapatnam, the TRT targets could not be achieved as dry bulk constituting 64 per cent of the total cargo was mostly handled by conventional means instead of through

mechanised facilities, consuming more time than required. Analysis of data on post-handling detention time for vessels at NMPT during 2007-08, revealed that 696 vessels were detained for more than three hours on an average beyond the normal time of two hours prescribed by the port. Such post-handling delays were mainly attributable to documentation and draft problems.

The average TRT at Berth No-9 having a Mechanical Ore Handling Plant, the most preferred berth at MGPT, was 5.93 days in 2007-08 against 5.76 days in 2006-07. Lower output during the year coupled with shortage of preferred berths caused the increase in TRT of the vessels.

Audit observed that the TRT for 2007-08 (Table 5.3) at the port's own container terminal in JNPCT was almost double the TRT of private operators, indicating higher efficiency of private terminals. This enabled the private terminals to handle more vessels than JNPCT.

JNPCT Berth	Number of vessels	TRT in days reported by Port
JNPCT	664	2.27
NSICT	722	1.04
GTIPL	941	1.48

Table 5.3

At Haldia, it was noticed that in the cases of 72 vessels, an average of 25 hours per vessel was lost due to idle time at berth and post-handling detentions during December 2007.

At Kandla, the high occupancy of berths was due to the vessels not leaving the berths after completion of handling. It was also noticed that in 114 cases during 2006-07, ships were detained after the completion of cargo handling for 11 to 24 hours against the average post-cargo handling detention of five to six hours at the port. This also led to idle occupancy of berths and increase in TRT.

At Mumbai, TRT was 2.91 days, mainly caused by the time lost at the berths. Out of 1.08 lakh hours spent at berths, 0.17 lakh hours were idle mainly on account of documentation problem.

5.5 Berth Occupancy

The berth occupancy factor (BOF) is the time that a berth is utilised, divided by the total available time. For a port, it is the primary indicator of congestion. As recommended in the Major Ports Development Plan by the Port of Rotterdam, 60-70 *per cent* would be the optimum BOF while higher berth occupancy would indicate congestion.

The parameter is defined as a percentage of the time when a berth is occupied to the total time

Berth no (NMPT)	No. of vessels handled in July and December 2007	Occupancy Percentage
10	28	71
7	9	60

Table 5.4

available at the berth. BOF is an important consideration for making investment decisions for addition of new berths or extension of existing ones. It was, therefore, important that the correct position of berth occupancy be presented to the Management and investors.

It was noticed in audit that the ports⁸⁴ were computing and reporting BOF in terms of the days when the berths were occupied during a year. Even when a berth was occupied for an hour during the day, occupancy for the whole day was reported. This resulted in reporting of high berth occupancy even when only a few vessels were being handled.

At New Mangalore Port Trust, berths handling fewer vessels also reported high occupancy as shown in Table 5.4 due to lower capacity of MLA's and non-mechanisation of berths. Similarly, at Visakhapatnam, Berth No EQ 2 reported 80 *per cent* occupancy, whereas it handled only 0.61 million tonnes of cargo during the year. At JNPT, during 2007-08, the berth occupancy reported was in the range of 54.71 to 84.55 *per cent*, whereas the berth occupancy calculated by Audit ranged from 31.38 to 83.65 *per cent* as shown in Table 5.5.

Type of berth	Occupancy reported by the Port	Occupancy calculated by Audit
JNPCT	84.55	79.66
GTICT	71.69	59.30
Shallow Water Berth	54.71	31.38
BPCL	60.29	59.55

Table 5.5

Calculation of berth occupancy in days did not give a correct position of congestion at the berths and also posed a risk in taking decisions regarding new berths, as cited in the following case study.

⁸⁴ NMPT however stated in June 2009 that they were computing and reporting BOF on hourly basis.

Case Study: Berth Occupancy at Cochin and Investment Decisions

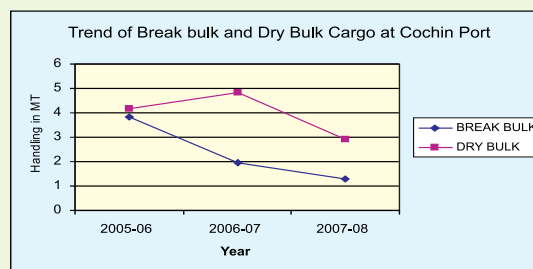
The port calculated berth occupancy by taking the occupancy for a day even when the berth was occupied just for a few hours during the day. Under this method, the berth occupancy was high despite the berths being vacant most of the time. Even though the port was operating at 56 per cent of its capacity, the berth occupancy figures at Cochin ranged between 60 and 72 per cent. It was seen that the occupancy of the berths would be lower, if calculated in hours, as shown below. The capital expenditure decisions for berth reconstruction and widening taken to address the high occupancy of berths are also shown below:

Occupancy in hours			
Berth no	Type of Cargo	Occupancy reported in days (per cent)	Berth occupancy based on hours (per cent)
Q1	General cargo	100	16.50
Q3	General cargo	75	35.30
Q6	General cargo/containers	67	54.63
Q7	Containers	30	26.30
Q8 & Q9	Containers	42	41.25
NCB & SCB	General cargo/Liquid Ammonia	59	44.90
Average		66	50.00

Capital expenditure decisions			
Sl. No	Name of the work	Board sanction	Tendered cost (Rs in crore)
1.	Widening of BTP	30.1.2006	3.85
2.	Reconstruction and revamping of NCB (for handling coal)	15.10.2007	19.88
3.	Re-constructions of Mattancherry /wharf (Q4 berth) (for handling dry bcarbulk (c) cargo)	31.10.2006	45.22

As seen from the table, the BOF fell sharply when it was computed in hours. Audit observed that in light of the low occupancy figures computed in hours and poor utilisation of capacity (56 per cent in 2007-08), the capital expenditure decision to reconstruct Mattancherry wharf (Q4 berth) needed reconsideration. In addition, the project also merits reconsideration in view of the following factors:

- (i) The consultant reported that the trend of the cargo was decreasing as shown in the figure below



- (ii) The wharf (Q4 berth) was being designed to accommodate vessels with draft of 12.5m. The average depth of Mattancherry Channel was only 8.10 m and it would require more capital investment for extensive capital dredging;
- (iii) Due to prevalent height restrictions by the adjacent naval base, two cranes of 25 tonne capacity each, could not be installed. Thus, operation of the berth remained a remote possibility.

The Management stated (May 2009) that the investments for creation of capacity were capital-intensive with a long-term life span and it may not be appropriate to limit the scope of future growth in view of constraints that were short-term in nature. The port ought to have considered factors such as availability of Ernakulam wharf with 12.5 m draft for handling bulk cargo, naval restrictions on the height of cranes and the possibility of higher utilisation of other berths, before going in for investment of Rs 45 crore on Mattancherry wharf.

The Ministry accepted (August 2009) the audit recommendations.

5.6 Port Capacity

In respect of major ports, the capacities of the port are the aggregated capacities of all their berths as computed below:

Capacity	=	330 x berth occupancy x achievable ship berth day output																		
		(=330 = No. of working days in a year)																		
Berth Occupancy	=	<table border="0"> <tr> <td>I</td> <td>Specialised terminals</td> <td></td> </tr> <tr> <td>a</td> <td>One berth</td> <td>60 %</td> </tr> <tr> <td>b</td> <td>More than one berth</td> <td>70 %</td> </tr> <tr> <td>II</td> <td>General cargo berths</td> <td></td> </tr> <tr> <td>a</td> <td>Upto three berths</td> <td>70 %</td> </tr> <tr> <td>b</td> <td>More than three berths</td> <td>75 %</td> </tr> </table>	I	Specialised terminals		a	One berth	60 %	b	More than one berth	70 %	II	General cargo berths		a	Upto three berths	70 %	b	More than three berths	75 %
I	Specialised terminals																			
a	One berth	60 %																		
b	More than one berth	70 %																		
II	General cargo berths																			
a	Upto three berths	70 %																		
b	More than three berths	75 %																		
Achievable Ship Berth Day Output	=	<p>Volume of cargo handled in that berth in a year/ berth utilisation in a year</p> <ul style="list-style-type: none"> ○ In the case of existing berths, the maximum output achieved during the past few years may be taken ○ In the case of new berths, average ship berth day output may be taken, considering parameters like type of cargo, method of handling, vessel characteristics and equipment productivity. 																		

Audit observed the following;

- As per para 7.1.2 of the recommendation of the IMG in July 2007, ports were to ensure round-the-clock operations by December 2008. By taking the working days in a year as 330, the calculation of capacity was conservative by 10 per cent.
- Berth occupancy was not computed properly in the ports as stated in Para 5.5 and further assessments based on such figures only distorted the capacity position.
- The capacity of berths did not represent the handling of cargo that was possible at a berth but was merely an extension of what happened in the previous years. This is explained by means of an illustration as shown subsequently:

Example:

Total cargo handled during a year = **600** tonnes

Berth occupied in days = 200 days

Capacity (taking 365 days) = **(Average output per day) X (Berth Occupancy) X 365**
 = **(600/200) X (200/365) X 365**
 = **600** tonnes

Thus the capacity calculated by the ports was equal to the cargo actually handled and had no relation to the size of berth, draft, other infrastructure facilities. As a result, the inefficiencies of the past years were being factored into the subsequent years due to which most of the ports were reporting high capacity utilisation.

Case Study: Ad hoc capacity calculations

(i) Capacity at Kolkata Dock System (KDS) (calculation as on 31 March, 2007)

- o For calculating the capacity at KDS, the actual ship berth day output was not taken but some projected figures were taken which were up to 85 *per cent* more than the actual. The increment in output considered for calculating capacity was not realistic when the equipment and all other factors remained the same.
- o Berth occupancy was taken as 75 *per cent* for all the berths even though the highest occupancy was 63 *per cent* and 21 berths had occupancy of 27 *per cent* or less with the least being 7 *per cent*.
- o KDS adopted 330 days for calculation of capacity against 365 days as envisaged in the port's policy,

(ii) Capacity at Cochin (calculations as on 31 March, 2008)

- o Instead of the actuals, projected figures were taken for outputs, which were not linked to equipment or other facilities at berths.

Berth No	Actual berth day output	Berth day output taken for capacity calculation
Q2	413	1500
Q3	562	1500
NCB	3899	3000
SCB	5412	3000
COT	27052	10100
NTB	9730	8000
STB	8389	8000
Q7	7541	6000
Q8	9562	6300
Q9	8152	6300

- o The capacity arrived at as per the calculation was 22.87 million tonnes as on March 2008 but the figure of reassessed capacity was finally stated as 28.37 million tonnes, indicating an addition of 5.5 MT. The reasons for addition of capacity were not available on record.

The Ministry stated (August 2009) that the capacity of the ports was assessed by the Engineering Wing of the Ministry after objective assessment of the infrastructure like jetties and equipment. The reply is not acceptable as it was found that the capacity calculations were based on past performances and objective assessment on the basis of available infrastructure was not being made.

5.7 Capacity Augmentation Schemes

Audit examination revealed that high capacity utilisation and berth occupancy were considered to be important parameters to justify expansion and addition of berths as well as other facilities by the ports. Inaccurate assessment of these parameters entailed the risk of creation of surplus capacity as discussed below:

- At Cochin, the capacity of the port as on March 2008 was 28.37 million tonnes. The actual cargo handled during the year was, however 15.76 million tonnes at 56 *per cent* of the capacity. Against this background, NMDP envisaged further capacity augmentation to 33.50 million tonnes at the end of Phase-I i.e. by 2008-09. As the capacity was already understated by factoring inefficiencies in the capacity calculations, the capital expenditure decisions taken by the port were not justified.
- In New Mangalore, four out of 13 berths had capacity utilisation of less than 50 *per cent*. Lack of facilities at the berths resulted in non-uniform utilisation of berths. It was also noticed that after creation of the facilities, the capacities remained unutilized. The capacity of New Mangalore as of March 2005 was 30.30 million tonnes which increased by 4.5 million tonnes during 2006-07 with the construction of an additional general cargo berth. The re-assessed capacity of the port as of March 2008 was 43.50 million tonnes. This capacity remained unutilised as shown in Fig. 5.8.

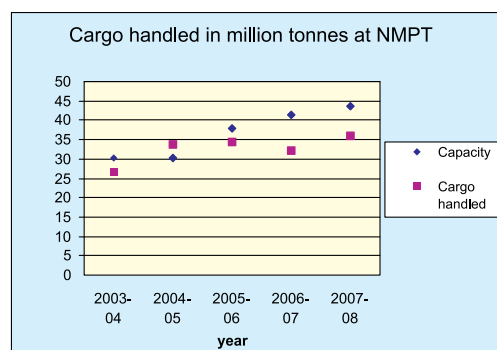


Fig 5.8

Recommendations

- All major ports should adhere to the defined common minimum standards of performance based on the output of standard equipment under normal working conditions, without making allowances for inefficiencies.
- In the case of equipment, the ports should adopt measures like prioritization and synchronization of maintenance schedules, proper inventory management, timely cargo aggregation and disposal of obsolete/surplus equipment without undue delays in achieving better availability and utilisation, rather than lowering the targets to indicate achievements.

- *The Ministry should ensure correct reporting of pre-berthing detention and turn-round time by the ports.*
- *The Ministry should consider computation of berth occupancy in hours, Capital expenditure decisions on new berths should be based on occupancy and utilisation figures of existing berths in hours.*
- *Capacity should be objectively assessed, based on the capacities of equipment and other infrastructure facilities and should not merely reflect the handling done during the earlier years.*

The Ministry stated (August 2009) that the cargo handled differed across ports and the equipment and infrastructure were not standardised.

The argument cannot be accepted as except for some types of cargo like logs or machinery for projects, most Indian ports were essentially handling similar cargo such as iron ore, coal, crude oil, POL, fertilizers and containers, although the cargo mix varied from port to port. Audit compared the targeted efficiency parameters for different types of cargo across ports (Figs 5.1, 5.2, 5.3) and found that the targeted outputs varied widely for similar cargo. For example, in the case of the most standard cargo i.e containers, the average output per day varied widely from 2500 TEUs per day to 18000 TEUs per day. Further, for each category of equipment, there needed to be a standard level of output on the basis of which, the efficiency targets for berths should have been fixed. Consequently, low targets in some ports did not motivate them to achieve higher standards of performance. Moreover, as explained in the foregoing paragraphs, efficiency enhancements could not be achieved by allowing targeted idle time at berth of over 20 *per cent* in seven of the 11 ports (Para 5.2.2) and equipment utilization target of less than 20 *per cent* (Para 5.2.3).

In light of the above, instead of fixing targets based on past performances, there was a need for defining standards across ports based on objective parameters like standard output of equipment and labour, so that reasonable and comparable standards of efficiency could be achieved at all ports.

The Ministry further stated (August 2009) that efficiency parameters like PBD and TRT were being monitored both by the Ministry and the IPA. In this regard, Audit noticed that details of the factors causing PBD and TRT at ports as required by IPA and the Ministry were not being maintained and reported uniformly by the ports. The Ministry's contention that the ports were maintaining the records of time taken for each activity from the vessel arrival at anchorage was, therefore, not acceptable.