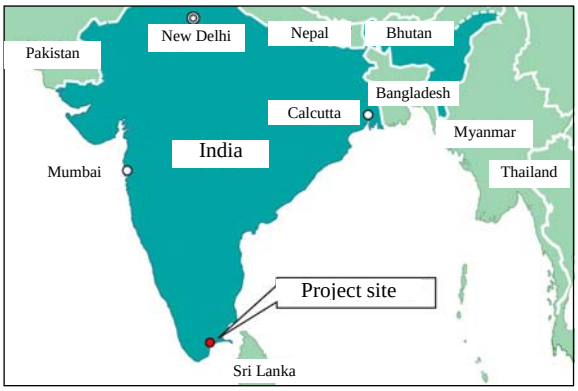
India

Tuticorin Port Dredging Project

Field Survey: August 2003

1. Project Profile and Japan's ODA Loan



Site location map

The harbor basin after dredging work was completed

1.1 Background

There are 11 major ports*[1] and 139 minor ports located on India's coastline (total length: 5,656km). Based on the Major Port Trusts Act of 1963, the major ports are operated by the Port Trust Boards, financially independent port authorities that fall under the jurisdiction of the Ministry of Shipping, Road Transport and Highways.

The breakdown of cargo types handled at the major ports during fiscal 1994 is as follows: 82.2 million tons (41.7%) petroleum, oil and lubricants (POL); 34.8 million tons (17.7%) iron ore; 29.9 million tons (15.2%) coal; 15.4 million tons (7.8%) containerized cargo; 10.6 million tons (5.4%) general cargo, etc. Cargo tonnage increased approximately 2.7 times from its fiscal 1980 level of 80.3 million tons to 215.3 million tons in fiscal 1995. Since 1993, cargo tonnages have exceeded facilities capacity at all major ports.

Containerized cargo has shown rapid growth, increasing some 4.7 times from its 1984 level of 3.3 million tons, and is forecasted to reach 108.1 million tons by fiscal 2005. Furthermore, under its eighth five-year national development plan (FY 1992-96), the government set forth goals for the port sector such as the modernization of port facilities, introduction of the latest technologies, efficient use of existing facilities, and expansion of container terminals.

Tuticorin Port has six berths for general cargo/container vessels, and one berth for POL, and two berths for coal. Despite a draught restriction of 8.24 meters, the large vessels and tankers that use the port are designed with draught restrictions of 9.14 - 12.80 meters, and such vessels were thus forced to operate by limiting their payloads. Therefore, efficient port management was hampered due to the high frequency of cargo traffic from reduced carrier vessels and the small volume of cargo being off-loaded per landing. In addition, the tonnage of vessels using Tuticorin Port virtually quadrupled between FY 1979 and FY 1996, increasing from 2.4 million tons to 9.2 million tons, and had already exceeded the 5.5 million ton*[2] vessel use restriction.

[1] There were 11 major ports at appraisal, but this had increased to 12 when this evaluation was conducted.
[2] Based on data compiled by the executing agency.

1.2 Objectives

The project's objectives were to alleviate draught[*3] restrictions by dredging port water and approach channels at Tuticorin Port in southern Tamil Nadu, and to improve the efficiency of port operations by increasing per vessel payload, and thereby contribute to economic growth in the state.

1.3 Outputs

The outputs of this project were as follows:

1) Dredging of approach channel
- Dredged sand volume: 580K m^3
- Channel length: 2.7km (currently 1.4km)
- Channel width: 183m (virtually identical to current width)
- Design water depth: 12.5m (currently 10.2-11.4m)

2) Dredging of harbor basin
- Dredged sand volume: 1.22m m^3
- Diameter of basin: 688m
  Dredging to increase water depth of zones fronting individual berths (Berth VII, etc.)
- Design water depth: 11.9m (current depth of basin: 10.6m; current depth of other frontal water zones: 9.5m-11.3m)

3) Vessel types targeted
- Bulk (dry) cargo vessels: length 230m × width 32.5m × draught 10.7m
- Bulk (liquid) cargo vessels: length 235m × width 32.5m × draught 10.7m
- Container vessels: length 220m × width 30.0m × draught 10.7m

4) Civil engineering works
- Dredger model: Cutter suction dredger
- Dredge sand disposal: to be dumped in two dumping grounds within port precincts
  Shore protection of areas peripheral to the dumping grounds
- Other works: greening/planting port areas

Of total project costs of 8,238 million yen, the ODA loan covered the entire foreign currency portion (2,787 million yen) and a part of the local currency portion (4,216 million yen when converted) for a total of 7,003 million yen (85% of total costs). The remaining local currency portion was covered by the funds from the executing agency.

1.4 Borrower / Executing Agency

The President of India / Tuticorin Port Trust

1.5 Outline of Loan Agreement

Loan Amount	7,003 million yen
Loan Disbursed Amount	6,026 million yen
Exchange of Notes	October 1997

[3] The distance from the bottom of a ship to the water's surface (depth of water needed to float a ship).

Loan Agreement	December 1997
Terms & Conditions	
Interest Rate	2.3%
Repayment Date	30 years
(Grace period)	(10 years)
Procurement	General untied
Final Disbursement Date	March 2002

2. Results and Evaluation

2.1 Relevance

At appraisal, this project was in line with India's eighth five-year (FY1992-1996) national development plan (i.e. to increase the efficiency of the port sector) and had been incorporated into the plan as a target project. The volume of cargo being handled at the port was increasing sharply and the load capacity of shipping vessels were increased through dredging, which suggests that there were powerful needs for measures to increase the efficiency of port management, which represented a compelling issue for Tuticorin Port[*4].

In India's ninth five-year national development plan (FY1997-2001), the planned cargo handling capacity of major ports was to be 344.4 million tons at the end of the plan; however, the actual volume is 289.1 million tons. In the tenth five-year plan (FY2002-2006), the government states that as the cargo handling capacity is no longer a constraining factor, it is now necessary to improve the quality of services and shorten the number of days on demurrage. As an indicator, the cargo handling capacity will be increased to 415 million tons (annual growth of 6%) at the end of the tenth five-year plan (2007). In terms of improving the services provided by existing port infrastructure and shortening the time on demurrage, there are strong policy-based connections between this project and India's tenth five-year plan, thus confirming the relevance of the project at the evaluation time point.

[4] Between FY 1990 and FY 1996 the volume of cargo handled increased by approximately 1.8 times, which was far higher than the average increase of around 1.5 times for all major ports. In addition, Tuticorin Thermal Power Plant, a major importer of coal was being forced to employ inefficient transport using reduced carrier vessels, thus major benefits were expected from this project.

[5] The construction of Berth VII in FY 1999 (exclusively for containers) has had an impact on the increases in containerized cargo handled. PSA/SICAL started container operations of Berth VII in December 1999, and having made capital investment of US$100 million, it is now possible to handle the cargoes of large 2000 TEU vessels (prior to the dredging work the port's handling capacity was 600-700 TEU).

2.2 Efficiency

2.2.1 Outputs

The project was executed almost according to the initial plans. The details are given below.

Item	Initial plans	Actual	Reasons, etc.
Dredging of approach channel	Water depth: 12.5m Channel length: 2.7km	Water depth: as planned Channel length: 2.5km	Since it was confirmed that the water depth was 13m at about the 2.5km point which was sufficient.
Dredging of harbor basin	Water depth: 11.9m Diameter: 688m	Water depth: as planned Diameter: 488m	Since the scope of dredging work was reviewed based on the detailed design
Landfill creation	17 ha	30 ha	Since the dredge sand volume exceeded projections
Greening/planting within Tuticorin Port	(no concrete figures are available)	9,463 saplings were planted in an area measuring 2,087 ha	—

Since the project was executed almost according to the plan, the changes in outputs had no impact on the generation of project effects. The expanded landfill area will be used for a new berth and container yard.

2.2.2 Project Period

As the table below shows, key project outputs were completed on or earlier than the initial schedule. According to the executing agency, the dredging work progressed favorably because the engineering department and operations department had consultations and adjusted the schedule almost every day based on the daily schedule of vessel arrival times. The delays in the greening and planting work were caused by the following reasons: (1) it took long time to select trees, a task that was commissioned to an agricultural university in the state, and (2) it took long time to introduce a water supply system (basically, the area suffers from water shortages); however, since the schedule and function of this work were not related to the dredging work directly, the delay had no serious adverse effects on the generation of project effects.

Comparison of Planned / Actual Schedule

Work item	Planned	Actual	Gap (Months delayed)
(1) Dredging of approach channel	May 2000	November 1999	- 6 months (shortened)
(2) Dredging of harbor basin	May 2000	November 1999	- 6 months (shortened)
(3) Landfill creation	May 1999	May 1999	on schedule
(4) Greening/planting	May 2000	December 2002	31 months

2.2.3 Project Costs

Total project costs were approximately 6,300 million yen when converted into Japanese yen, which was less than the planned budget. Even when the costs are converted into local currency (Rupee),

actual costs amount to approximately Rs 1,770 million as compared to the planned budget of around Rs 2,416 million. These savings were the result of competitive bidding, which resulted in efficient orders received.
A breakdown of the costs is given below.

Item	Foreign currency (million yen)		Local currency (million Rupees)		Total (million yen)		Cause of deviation
	P	A	P	A	P	A	
1. Preparation work	202	663	127	11	636	5,773	The bidding price was lower than the initial estimations
2. Dredging of approach channel	663	1,698	373	-	1,935		
3. Dredging of harbor basin	1,385	3,375	779	-	4,043		
4. Landfill creation	0	0	23	57	79	235	The bidding price was lower than the initial estimations
5. Greening/ planting	0	0	24	8	81		
6. Reserve fund	225	0	145	-	720	0	No specific costs generated.
7 Interim interest / taxes	312	290	127	-	744	290	
Total	2,787	6,026	1,598	76	8,238	6,298	

Note: At appraisal (April 1997), the exchange rate was 1Rs=3.41 yen; at the implementation stage (May 1995) it was 1Rs=3.56 yen.

As a whole, since the project outputs were generally completed as planned, and the project costs and period were within the scope of the original plans, it can be said that the efficiency of the project is high.

2.3 Effectiveness

2.3.1 Changes in Cargo Handling Volumes, etc.

Indices relating to the operational efficiency of the port prior to and after the implementation of the project (shaded sections represent the actual implementation period) are as shown below; the project contributed to overall improvements in these indices[*5]. Specifically, all indices were stagnating in the years before the execution of dredging work, and the increasing effect on the port's vessel acceptance capacity is significant.

Cargo Handling Status at Tuticorin Port

Year	1995	1996	1997	1998	1999	2000	2001	2002
1. Freight volume (unit: 100 thousand tons)								
Total (A-D)	**92.9**	**91.7**	**99.7**	**101.5**	**99.9**	**122.8**	**130.2**	**132.9**
A) Containerized cargo	7.6	9.0	11.2	12.1	16.3	15.7	22.0	23.0
B) General cargo	11.9	10.8	11.6	12.9	16.7	18.9	21.0	19.7
C) Dry cargo	63.7	62.6	66.4	65.4	57.1	77.2	77.8	80.9
D) Liquid cargo	9.7	9.4	10.6	11.1	9.9	11.0	9.4	9.3
2. Containerized cargo (TEU)[*6]	68,619	88,769	102,464	99,512	136,612	156,978	213,509	212,925
3. No. of port calls (vessels)	982	968	1,092	1,128	1,106	1,236	1,421	1,458
4. Total tonnage of incoming vessels: GRT[*7] (100 thousand tons)	100.3	103.3	116.9	114.1	101.3	129.5	137.8	141.4
5. Maximum shipping weight of incoming vessels: (100 thousand tons)	154.3	155.8	177.3	185.6	165.3	203.0	218.4	224.1* (interim value)
6. Container ratio (%)	8.2	9.8	11.2	12.0	16.3	12. 8	16. 9	17.3
7. Average waiting time (days)	2.3	1.6	1.7	1.6	3.0	1.4	1.6	1.4

Source: Tuticorin Port Trust

During the five years from appraisal (1997) to FY 2002, the average annual growth rate in total cargo handled at Tuticorin Port was 8.4%, and although this exceeds the average rate for all India's major ports (5.3%)[*8], the actual total cargo volume for FY 2001 was 13.02 million tons, whereas the predicted total cargo volume for that year was 16.5 million tons, i.e. 80.5 % of the target level.

By cargo type, volumes of containerized cargo, general cargo and dry cargo have all been growing favorably since project completion. However, increases in the volume of liquid cargo handled have been sluggish due to stagnant demand for POL from Indian Oil, a major port user, and this is considered to be one of the major reasons for actual total cargo volumes failing to reach target levels. Regarding the average number of waiting days, since the dredging work made it possible for large

6 Twenty-foot Equivalent Unit: the unit represents the number of containers when converted into a twenty-foot container equivalent.

7 Gross Registered Tonnage: a vessel's capacity, i.e. vessel size. It is obtained by multiplying a vessel's total capacity by a fixed coefficient.

8 Annual average growth rates were calculated using "Major Points of India A Profile: 2001-2002".

9 SIPCOT (State Industries Promotion Corp of Tamil Nadu) operates 17 industrial estates within Tamil Nadu State. The industrial estate visited during this evaluation is located about 15 kilometers from Tuticorin Port. Most of the other companies surveyed were located within 30 kilometers from the port.

vessels to call at Tuticorin, now vessels need to enter the port less frequently than before in order to transport the same volume of cargo, and there has been a moderate downward trend in this index since project completion.

Accordingly, since the average number of waiting days has decreased, despite increases in cargo volumes and calling frequency, the project is considered to have made it possible for large vessels to call at Tuticorin Port, to have enabled efficient port management, and to have resulted in growth in cargo volumes.

2.3.2 Internal Rates of Return

(1) Recalculation of the Financial Internal Rate of Return (FIRR)

Compared with 18.2% calculated at appraisal, the recalculated FIRR, on the basis of data submitted by the executing agency, was 13.3%. The FIRR fell below the appraisal figure because annual revenues from port tariffs are about 26% lower than original estimations. This corresponds to the current situation which gross cargo handling volumes are lower than initial forecasts, as a result of the downturn in volumes of liquid cargo traffic handled. This is due to marketing strategy for improvement of the international competition to set the tariffs lower in order to boost the handling volume.

(2) Trial calculation of the Economic Internal Rate of Return (EIRR)

When the EIRR was test recalculated the resultant figure was 25.4%. This shows that the project had major significance for the national economy. The benefits were taken as (1) the reductions in vessel waiting time, and (2) the reductions in vessel procurement costs contingent upon the dredging work.

2.4 Impact

2.4.1 Initially Projected Impacts

The impacts of the project were confirmed by interviews with companies (in the chemicals, fisheries and salt refining businesses) located near the port, which were considered to be its main beneficiaries, and companies (major operators in each sector) in the industrial estate that is operated by the State Industries Promotion Corporation of Tamil Nadu (SIPCOT)[*9]. The benefits of transport cost savings are limited to companies handling large quantities of cargo; however, other companies have enjoyed the merit of shorter times on demurrage[*10]. Survey results also evidenced that operations of port carriers have become more active.

[10] Longer demurrage times create obstacles for both shippers and ship owners in terms of delivery schedules, vessel usage, etc., resulting in larger losses.

Results from interviews with major companies

Sector	Company Name	Main Products	Annual sales Annual production	Project Impacts
Chemicals (incl. metals)	SPIC	Chemical fertilizers / agents	US$350 million (sales)	Large vessels can now import raw materials, resulting in annual savings of US$200,000
	Sterlite Copper	Copper anodes	180 thousand tons (production)	Nothing specific now
	Kilburn Chemical (industrial estate tenant)	Titanium dioxide	Rs400 million (sales) 7,500 tons (production)	There are no specific impacts because cargo volumes are small
	DCW	Caustic soda	Rs5,500 million (sales)	There are no specific impacts because cargo volumes are small
Fisheries	Nila Sea Food	Shrimp, squid, etc.	5,500 tons (production)	There are no specific impacts because cargo volumes are small
Salt refining	Tuticorin Salt and Marine Chemical	Salt, processed salt products	Rs50 million (sales) 50,000 tons (production)	·There are no specific impacts because raw salt is transported in relatively small vessels, but demurrage times have decreased · Since processed products are shipped in containers, transportation has become more efficient
Port carriers	St. John Freight System	General port transportation	50 thousand tons (handling volume)	· Large vessels can now call in, resulting in transport cost savings · In the past 5 years, the number of carriers has grown from 50 to 100 · The company has started exporting directly to major foreign ports from Tuticorin

In addition to the above, the following impacts were pointed out by those concerned.

Tuticorin Thermal Power Plant

The weight of coal per vessel has increased from about 25 thousand tons to 40 thousand tons. For this reason, the number of vessels necessary to transport the same volume of coal has been reduced,

enabling annual savings of about Rs400 million.

SIPCOT Administration Office

The number of tenants has increased since the project started in 1997. There are 53 tenants now and 26 of them moved into this industrial estate in that year. This is mainly because of improvements in water and power supply facilities on the estate; however, the increases in port capacity due to the project also have had an impact. Many of the 26 companies are export-oriented: chemicals, food producers, etc., and all are port users.

New Tenants for the Industrial Estate

Fiscal year	1993	1994	1995	1996	1997	1998	1999	2000	2001
New tenants	15	4	5	3	10	5	3	2	6

Tuticorin Chamber of Commerce

Company members of the chamber of commerce (grain producers, general cargo handlers, timber producers, resident industrial estate companies, etc.) use vessels jointly and have saved about US$5 per ton on transport costs.

2.4.2 Environmental Impacts

According to the executing agency, there have been no environmental impacts due to the project. A report from local fishermen that was obtained via the fishery company also contains no adverse impacts on the fishery industry.

2.4.3 Other Socioeconomic Impacts (effects on local residents)

The project did not require the acquisition of any land or relocation of residents.

2.4.4 Other Impacts

According to the executing agency, the volume of trade between Tuticorin and Colombo Port (most of which is exported from Tuticorin) – a major port near Tuticorin Port – increased rapidly from 59 thousand tons in fiscal 1999 to 326 thousand tons in fiscal 2001 (i.e. an increase of approximately 5.5 times), since larger vessels can be used now because of the dredging work.

2.5 Sustainability

2.5.1 Executing Agency

(1) Technical Capacity

Since maintenance dredging is not necessary at Tuticorin Port, the port trust does not have a particular department for this work. However, it is possible to utilize the Dredging Corporation of India, an external specialist institution, if maintenance dredging becomes necessary in the future. The engineering department is responsible for the maintenance of other port facilities.

(2) Operation and Maintenance Status

At the time of appraisal, Tuticorin Port Trust had 2,370 employees in total; however, thanks to the reduction through mandatory retirement and it can be said that it leads the introduction of an early retirement system, the figure had dropped to 1,549 in 2003 and it can be said that it leads to the improvements in its financial status, which are detailed below. The executing agency (engineering department) says that there are no specific organizational problems and it has no plans for structural reform. However, in line with recent government policy, the port trust is promoting the introduction of private sector by, for example, consigning container operations at Berth VII to PSA/SICAL, a Singaporean corporation as of December 1999.

(3) Financial Status

As shown by recent financial statements (see below), the executing agency is expanding its sales favorably and is posting a profit continuously. Profits reached approximately Rs400 million in FY 2001, which is equivalent to 1.7 times the profit level at appraisal (1997).

Tuticorin Port Trust Profit and Loss Statement (million Rupees)

Fiscal Year		1999	2000	2001
Operating income	Cargo handling/storage	498.1	579.6	564.7
	Port/docking fees (including dredging tax)	292.0	463.6	498.2
	Rail tariffs	13.5	15.3	18.9
	Property rental	97.6	87.0	88.5
	Total	901.4	1,145.6	1,170.5
Operating expenditure	Cargo handling/storage	115.5	119.4	108.9
	Port/dock facilities costs	155.9	195.1	197.9
	Rail facilities costs	13.7	16.4	16.2
	Land/buildings for rent	46.0	59.4	66.5
	Administrative costs	191.1	210.5	191.1
	Total	522.4	601.2	580.8
Gross profit		378.9	544.4	589.6
Finance/miscellaneous income		120.3	167.1	183.3
Finance/miscellaneous expenditure		130.2	337.7	368.0
Net profit		368.9	373.8	404.9

Tuticorin Port Trust Balance Sheet (million Rupees)

Fiscal Year		1999	2000	2001
Assets	Fixed assets	4,483.8	4,691.1	5,020.1
	Liquid assets	1,090.8	1,417.8	1,519.0
	Investment	540.1	694.1	853.3
	Total	6,114.8	6,803.0	7,392.5
Capital/ liabilities	Reserves/surplus	2,536.4	3,142.5	3,516.1
	Depreciation allowance	499.0	555.4	636.5
	Capital liabilities	2,440.1	2,240.0	2,392.8

	Pension funds, etc.	355.2	500.1	565.5
	Current liabilities	283.8	364.8	281.3
	Total	6,114.8	6,803.0	7,392.5

According to the executing agency, the reasons behind the results are as follows.

Growth in Cargo Traffic

As mentioned above, total cargo traffic increased by approximately 33% during the three years from FY 1999 to 2001.

Port Dues

Port dues are reviewed every two years (and are subject to government approval), but have remained stable, without fluctuation, during recent years.

Recovery of Port Dues

Port dues are paid by importers and exporters or their representatives and are pre-paid, in principle. Therefore all dues are recovered.

2.5.2 Operation and Maintenance Status

At most ports, dredging work (maintenance dredging) is necessary for maintenance purposes. However, this is not necessary at Tuticorin Port due to the following reasons: (1) Tuticorin Port receives physiographic protection from Sri Lanka, and because of its structure, accumulation of sand due to tides and winds is difficult, and (2) the bedrock on the ocean floor is very hard and this is not a river port. Therefore dredging is not generating any maintenance costs.

To summarize the above, the project succeeded in securing the planned water depths in the approach channel and harbor basin, and the port is functioning as expected.

Moreover, no maintenance costs are being generated since no special work is necessary to maintain the water depth thanks to the port's geographical advantages. The executing agency is not facing any particular problems either organizationally or financially, and the overall sustainability of the project is deemed to be high.

3. Feedback

3.1 Lessons Learned

None.

3.2 Recommendations

None.

Comparison of Original and Actual Scope

Item	Planned	Actual
(1) Outputs	1) Dredging of approach channel, etc. Dredge sand volume: 580 Km^3 Channel length: 2.7km Channel width: 183m Water depth: 12.5m 2) Dredging of harbor basin, etc. Dredge sand volume: 1.22m m^3 Water depth: 11.9m 3) Landfill revetment Landfill area: 17 ha 4) Environmental measures Greening/planting work within port zones	1) Dredging of approach channel, etc. Dredge sand volume: 690 Km^3 Channel length: 2.5km Channel width: as planned Water depth: as planned 2) Dredging of harbor basin, etc. Dredge sand volume: 1.60m m^3 Water depth: as planned 3) Landfill revetment Landfill area: 30 ha 4) Environmental measures 9,463 saplings planted in an area measuring 2,087 ha
(2)Project period L/A conclusion Dredging of approach channel /harbor basin Landfill revetment Environmental measures	December 1997 May 1997 - May 2000 June 1998 - May 1999 February1998 - May 2000	December 1997 May 1997 - November 1999 June 1998 - May 1999 September 2001 - December 2002
(3) Project costs Foreign currency Local currency (local currency conversion) Total ODA loan portion Exchange rate	 2,787 million yen 5,451 million yen (1,598 million Rupees) 8,238 million yen 7,003 million yen 1 Rs = 3.41 yen	 6,026 million yen 272 million yen (76.4 million Rupees) 6,298 million yen 6,026 million yen 1 Rs = 3.56 yen

Third Party Evaluator's Opinion on
Tuticorin Port Dredging Project

Mr. SAUMITRA CHAUDHURI
Economic Advisor
ICRA Limited

Effect

The most prominent aspect of the project clearly lies in the prompt and cost-saving execution of the components that primarily yield the project effects (channel and harbour dredging), with significant gains in freight volumes in 1997 (May though December) itself and accompanied by a large (23.5%) saving in planned costs. The savings in project cost holds a lesson perhaps as to the gains that can be had from a well designed bidding process.

In estimating the physical gains from the project effects, I have compared the average figures for freight handled in 1995 and 1996 and compared them to the average in 2001 and 2002. What emerges is that total freight handled has risen by 42.5% in tonnage terms, while the total shipping tonnage (GRT) has risen by 37.1% and the maximum vessel size by 42.7%. It also turns out that the number of vessels calling at the port increased by 47.6% – a factor larger than the gains on the other handling parameters. Average waiting time fell by as much as 23.1%.

There are indications that the dredging project has been able to nearly double the port capacity. This follows from the fact that if the increased number of port calls (1.476) is multiplied by the increased maximum vessel size (1.427), the cumulative expansion should have been 110.7%. This follows from one of the justification for the project which is that low available draught in the channel and harbour was responsible for "vessels (being) forced to operate by limiting their payloads … efficient port management was hampered due to the high frequency of cargo traffic from reduced carrier vessels and the small volume of cargo being off-loaded per landing" [p.1 of *Field Survey (August 2003)*]. However, following on the completion of the project, the biggest expansion was in the number of vessels, which factor was larger than that of the total freight handled or total shipping tonnage or even of vessel size. If payload restriction was to be mitigated by the project, one would have expected freight volume expansion to have much exceeded the number of port calls.

A possible explanation as to why the fully capacity expansion effect of the project has not manifested itself yet, is that there might be an absence of adequate demand. In terms of type of cargo, container freight has risen by 171% in both tonnage terms and volume (TEU) terms. General cargo has gone up 79.3%, but dry cargo which is still the *most important* category has risen by only 25.7%, while liquid cargo has actually *declined* by 2.1%. The *Field Survey (Aug 2003)* notes that "gross cargo handling volumes are lower than initial forecasts" resulting in port dues being "26% lower" than expected and hence a lower FIRR (p.7).

Given that water depth at 2.5km point was 13m (p.4), the extent of dredging has enabled the port to maximise capacity in so far as draught is concerned. The construction of a new berth and container yard should be able to create more offsetting shore-based capacity to cater to growing container, general and dry cargo handling demand. Aside from the fact that positive economic externalities have materialized as in the case of significant financial savings by Tuticorin Thermal Power Plant (p.8), the materialization of even a13.3% FIRR on the basis of actually realised freight volumes within three years after project completion, for what is a very long-term port capacity augmentation, is an *exceptional achievement*. Given that India's external trade is rising at a rapid pace, the current demand limitations facing the Tuticorin Port are bound to ease in the years to come and the full benefits of the project would come into play, *albeit* over a longer period of time than might have been visualised originally.