CHAPTER II

REVIEW OF LITERATURE

Ports play a vital role in Indian economic development. As in most of the developing countries, the ports in India have found increasing attention in recent years as one of the cheapest and eco-friendly harmless modes of bulk transport system. Performance of the ports is significantly affected by and also significantly affects the pace of development of the economy of the country. Consequent to the policy of globalization and the strategy of export led growth adopted by the country in 1991, the seaports are going through a process of rejuvenation partly to capture the world market and partly by the technological progress in cargo handling. It is in this context, Tuticorin Port is taken up for this study. The focus is two fold. First, as an enterprise the Tuticorin Port Trust is studied for its performance efficiency and second, for its contribution to the development of its hinterland, with special attention to the labour market. The first attempt in the study is to review the literature, with a view to gaining sufficient knowledge of the role and nature of the performance of the port. This review will be useful to define specific objectives, hypotheses and to delimit the scope of the study as to focus on the economic efficiency and development implications of the port. The review of literature is presented in this chapter.

Importance of Trade

The role of international transport is to bridge the spatial separation of trading countries. Shipping is for the most important mode of
transport of international trade. In terms of weight, something like 90% of all international trade moves by sea, and the long distance trade is mostly sea borne. Owing to the fact that the average transport distance is much longer in international than in intranational trade. Shipping has a peed role in the total transport work made by all other modes of freight transport. According to one estimate (Swedish Shipping Gazette) the total ton-miles by sea are more than twice the total ton-miles by road, railway and air put-together.¹

North² has pointed out that the growth of Pacific North West region was due to trade by sea and that the history of lumber industry reflects a preoccupation with markets foreign to the region. The first lumber shipment went to California in 1847, and during the Gold Rush lumber export from the Pacific North West expanded rapidly. The rate of growth of the lumber industry was directly related to the growth of the markets reached by water (primarily California, British Coloumbia and some foreign markets).

James³ emphasizes that transportation, especially from water to land, combined with the fact that water transportation is generally cheaper than land transportation where time is not an important

---

consideration, are important in explaining the location of many cities. East Coast seaports form the natural break for trade between the United States and Europe and Latin America. Moreover, considerable freight moves from West Coast ports, and even from Asia, the Panama Canal, to East Coast ports rather than overland by more expensive routes. New York City, with its large, excellent deep-water harbour and its easy access to a large interior area via the Hudson Valley and the Erie Canal, occupies the most strategic transportation-break location on the East Coast. Moreover, East Coast ports afford strategic locations for the collection of widely distributed raw materials and for the shipment of finished commodities to other continents and to their own hinterlands. West Coast ports, similarly, afford transportation breaks between their own hinterlands and other ports in the United States, Latin America and Europe. Great Lakes ports represent breaks at which iron, coal and other raw materials can be collected and finished commodities distributed to the North Central States. The Gulf Coast cities represent both breaks in trade between the interior hinterland and other ports of the world, and strategic locations for certain types of manufacturing. Interior cities located on large rivers historically represented breaks in transportation where land routes attempted to cross streams without bridges, or where supplies were shipped by water to a regional median point and then distributed overland to the residents of a region. New Orleans grew at a strategic point where river-borne freight on the great Mississippi and its tributaries could be transferred to or from
ocean-going ships. Thus breaks in transportation, especially from water to land, help to explain the locations of many port and river cities.

Stone⁴ observes that policies relating to transport can have a profound effect on spatial distribution, and on economic and social well being. Transport policies appear to be aimed more at meeting industrial and commercial demand. Changes in the relative importance of the different types of goods entering overseas trade and the countries with which the U.K. trades, together with consequential changes in shipping and goods handling, have had a profound effect on the growth and decline of ports. The growth in the size of ships and the development of new types, large tankers, bulk carriers, container and roll-on / roll-off ships, together with a demand for speedy loading and unloading, has been to the advantage of modern ports, with deep water, large areas of uncluttered space, modern handling equipment, a flexible labour force and good road communications. The growth of trade with Europe has given east coast ports an advantage area than those of on the west coast.

A few ocean ports have become important production centres. Hoover⁵ is of the opinion that transportation network creates favourable access areas. The nature of the transportation system connect places of resource, supplies, production centres, and markets sometimes create, apart from any natural advantage, favourable input access locations. Thus, when an input of secondary importance (from the point of

transfer costs) is separated by some distance from the major input source, the volume of outbound traffic may be considerably greater than the volume of traffic in the return trip. In this case low back haul rates on the major input may make competitive production possible at the site of the minor input of greater importance, perhaps, are transhipment points. All factors necessary in the production of particular products are in some instances first assembled at such points. And total transfer costs associated with production at transhipment points are often less than or equal to total transfer costs realized at alternative production locations. Thus, some ocean ports and rail heads have become important production centres.

Chaudhuri and Chatterjee⁶ emphasize that in a less developed economy, industrialization is synonymous with economic development and one way to boost up industrial activity is public sector investment in capital goods and large scale manufacturing sector. The much quoted Mahalanobis Strategy had the same message for India's industrialization. Both industrialization and investment in capital goods deserve attention to the development of ports as a strategic link in cost effective international trade.

North\(^7\) has concluded that some regions, because of locational advantages, have developed an export base for manufactured products, but this is not a necessary stage for the sustained growth of all regions. A great deal of secondary and tertiary industry may also result from the success of the export base, and in all livelihood, provide for widening the export base as the region develops.

The growth of regions has tended to be uneven. An increase in demand for the region’s exports or a significant reduction in processing or transfer costs has resulted in a multiple effect on the region, inducing increased investment not only in the export industry but in all other kinds of economic activity as well.

As a region’s income grows, indigenous savings will tend to spill over to new kinds of activities. At first, these activities satisfy local demand, but ultimately some of them will become export industries.

Stabler\(^8\) argues that the initial step in the development process is a reduction of transfer costs. Probably the best way to accomplish this in a primitive economy is by improving the transportation network. Lower transfer costs make it possible to trade with other areas. By shifting the region’s resources into that use (those uses) which provides the greatest competitive advantage and it becomes basis for trade.

---


Ghosh and De\textsuperscript{9} have pointed out that in literature, the public investment on physical infrastructure consists of transport (roads, railways, aviation, water ways and ports), electricity, irrigation, telecommunication, housing and water supply, has its impact on both private investment behaviour and regional economic development and the result has been found to be highly significant and positive.

Yao and Liu\textsuperscript{10} show that the south eastern coastal cities in China are part of a region which, by its historical functions as ports and strategic position as part of the emerging Asia Pacific sub global region, was chosen by the Socialist Government to be “Opened” to the market economy from the late 1970s. This region has now an advanced economy and a high degree of urban concentration, showing importance of the location of ports.

Cooley\textsuperscript{11} emphasized the break in transportation theory of city location. He points out that routes of heavy transportation channelize the movement of great volumes of goods from area to area. The physical transfer of these commodities from one conveyance to another, their servicing at places of transfer of stoppage, and the keeping of records of

\textsuperscript{9} Buddhadeb Ghosh, Prabir De, “Role of Infrastructure in Regional Development, A Study over the plan period”, \textit{Economic and Political Weekly}, 33(47248) : 3039, 1998.


change in ownership require the aggregation of urban population at breaks in transportation. Thus, development of trade and transport helps urbanization.

Haig\textsuperscript{12} dealing primarily with industrial activities, concludes that they tend to locate and develop where transportation is least costly.

De and Palit\textsuperscript{13} find that the significant performance in the port sector can lead to significant increases in port throughput, which may then increase the demand for port services. In explaining this, they have found, increasing economies of scale. If a port performs better by improving its operational and asset performance initially, it is going to get higher, traffic. If ports fail to perform better, they will be losing market share to the neighbouring efficient ports. However, in explaining this, they have not considered the implications of scattered concentration of industrial locations in and around the ports and differential geographical attributes, quality and quantity of logistics networks, and differential infrastructural stocks.

\textbf{Importance of Ports in Developing Countries}

Without Hamburg, Bremen, Rotterdam or Antwerp, for example, Western Europe could never have achieved such a spectacular and rapid progress. For various reasons, the economy of a developing


nation depends on maritime trade and on ports to a still higher degree in the case of affluent countries\textsuperscript{14}.

Developing countries are still dependent on imports and exports as the core of the economy. Many industries are still in their infancy and from many more industries 'quality' products are yet to make an inroad into the world's competitive markets faced with ever increasing population, troubled by natural calamities like floods, droughts and famine, pressed by the slow progress in agriculture, massive imports of food from overseas become a must "Economic of most of the individual regions are similar rather than complementary"\textsuperscript{15}.

Kuznets\textsuperscript{16} says that urbanization is largely a product of industrialization. The economies of scale arising from non-agricultural pursuits as a result of technological changes led to the movement of a large proportion of labour and population from the rural to the urban areas. As the technical means of transportation, communication and organisation grew more effective, there was the spread of increasing optimum scale units. All these processes affected the grouping of population by social and economic status and transformed the basic pattern of life. The effects of urbanisation on modern economic growth of developed nations led to the decline in birth rate and the shift toward the small family. It brought

\textsuperscript{14} B. Nagorski, "Port Problems in developing Countries", Economic Independence of Ports (Report), 1972, p.11.
\textsuperscript{15} Ibid, p.6.
people together from different rural areas who initiated and learnt from each other and from those already living in towns. It facilitated the development of impersonal relations of modern life and also taught cooperation.

Sam\textsuperscript{17} observes that, urbanization in the state can be considered a reflection of its industrialization occurring either in a balanced or imbalanced manner. Balanced industrial distribution leads to corresponding balance in economic well being of the people. Hence a policy for industrial distribution should aim at a policy of economic dispersal and balanced urbanization.

Aroma's study reveals that during the early time cities spread mainly on the riverbeds. Trade and agriculture were their main occupation, which helped the cities to grow. These towns were called centres of primary production and trade.

Migration of labour to the cities in order to get higher paid jobs in industrial establishments and business or for finding good housing, medical and education facilities for children have been contributory factors. The cultural factors also played a significant part in the growth of cities. There are many religious centres, places of pilgrimage and memorial cities. Thus the economic, political, social and cultural factors all together work towards rapid urbanization.

\textsuperscript{17} Aroma Glory Sam, "Economics of Urbanization – A Case study of Madurai Agglomeration", Doctoral Thesis, Madurai Kamaraj University, 1977, pp 182-83.
Lewis's\textsuperscript{18} model shows how the rural surplus labour gets absorbed in the modern sector. In his model the modern sector draws labour force from the traditional unorganized sector paying a subsistence wage to the workers. This cheap labour facilitates the generation of capital in the modern sector. As more labour is withdrawn from the traditional sector, more will be the capital available for reinvestment. The capital accumulated will result in an increase in productivity of labour. The increase in the productivity of labour further results in capital accumulation. Capital accumulation may slow down, if the subsistence wage payable to the workers drawn from the traditional sector increases. This is quite plausible because as labour withdrawn from the traditional sector increases it makes the capitalist pay higher wages for the surplus labour. This puts a limit on the extent of surplus labour which can be withdrawn from the agricultural sector and also reduces the chances of building up more and more capital base in the industry.

Sharma\textsuperscript{19} stated that important water fronts have led to the growth of cities all over the world because of the following factors.

1. Building highways is a costly affair and has been usually the construct of forced labour. Water fronts are bountiful supply of nature.

2. Roads being extremely unsafe in winter, river boats are the alternative means of transport to the bulk of the city population dwelling close to water fronts.

3. River transport is by far the fastest means of travel.

\textsuperscript{18} W.A.Lewis, "Economic Development with Unlimited Supplies of Labour", The Manchester School, 1954, p.440-449.

4. Water transport is even today the cheapest for bulk items like coal, oil, wheat etc.

5. International trade relies largely on ocean routes like Panama and Suez canals.

Hence, many cities have sprung up on riverbanks and spread to the fringe areas sometimes across the river to meet the needs of the growing population. The growth of cities like Bombay has been obstructed because of the limit placed by the surrounding water. Calcutta, situated on the Hoogli is an important social, economic and political unit in our country because of the natural advantages. In view of a river bank it has proximity to areas abundant in cash crops like cotton, jute etc., and the fine communication and transport network it enjoys in rural and urban areas.

Fujita and Mori\textsuperscript{20} have stated that perhaps, the most striking feature of today's economic geography is the concentration of economic activities in cities. The traditional modeling of port cities by location theorists and urban economists (e.g. Mills, 1972, Ch.5; Goldstein and Moses, 1975; Schweizer and Varaiya, 1976; Schweizer and Varaiya 1977) represents the geographical counterpart of neoclassical trade theory based on comparative advantages. That is, because of differences in technological conditions (e.g. climate or soil) or immobility of some

production factors (e.g. mineral deposits, or labour and capital confined within borders), each region is supposed to have comparative advantages in the production of a certain set of goods, which are produced under constant-returns technologies and traded with other regions. In this context, the production activity of each region is organized surrounding high quality ports (more generally, transport nodes) for the convenience of exports of final products and imports of other region's goods, which leads to the formation of port cities.

**Theoretical Base**

Ghosh and De\(^\text{21}\) stated that but up to the eighties economists did not deal directly with such factors as transportation and ports, manufacturing belt and urbanization which exemplified 'increasing returns'. Thus, until recently, the relationship was rather asymmetric.

Traditional trade economists have been regarding the national economy as 'spaceless' (Krugman 1998)\(^\text{22}\). 'Space', or what may be called 'geography', is so important that it can neatly divide the world into some basic building blocks.

Moreover, a significant share of the population in the developed countries is concentrated in the coastal region. By sharp contrast, the population in south Asia is heavily concentrated in the interior.


Even in those states that have a very high coastal line, the main centres of economic activity are located in the hinterland.

It is worthwhile to mention here that nearly 200 years after Johann von Thunen’s Isolated State (1826), 70 years after Alfred Weber’s Theory of Location of Industries (1929), 50 years after August Losch’s The Economics of Location (1954) and Walter Isward’s Location and the Space Economy (1956) were published, nowhere in the world do spatial factors like transportation (and more specifically, port), regional inequality and urbanization have found any place in economics textbooks.

In the standard neoclassical formulation, there is a natural smooth tendency towards inter-regional transmission of growth from the richer to the poorer regions within an economy with perfect mobility of factors and diminishing returns to capital. Barro and Sala-i-Martin (1995)\textsuperscript{23}, Quah (1993)\textsuperscript{24} and many others have tried to test the hypothesis of convergence of economic growth or levels of economic development among different regions within a country and also among different advanced countries themselves. But this theorization pays little attention to the spatial variables which, for all practical purposes, have significant influence on the process of economic development.

A parallel literature in economic geography has been simultaneously trying to enrich the explanatory power of the regional development theory incorporating the impact of external sector on

domestic economic development more specifically. Thus over the past two decades a 'new trade theory' and a 'new economics of competitive advantage' have emerged which have brought to the forefront the role that the internal geographical factors of a nation may play in determining the trading performance of that nation's industries as well as concentration / spread of economic activity. In this endeavour, Paul Krugman, the leading exponent of the 'new trade theory' has sought to answer how international trade of a country is both influenced by and in turn influences the process of geographical distribution of economic activities within a nation (Krugman 1995)\textsuperscript{25}.

One of the most important justifiable forms of industrial (and trade) policies that regional, industrial and locational factors merit is neglected in most of the LDCs and of course in India.

Most studies have addressed the role of transport in regional development but very few of them have assessed the significance of ports therein.

**Ports in Theory**

A port is essentially an economic concept, an economic infrastructure that serves coastal and overseas traffic. Port is a sub-system of the total transport network and a meeting place of other modes

of transport. A port is a gateway for the entrance from surface water to land and vice versa.

There is sufficient evidence in literature of a strong spatial relationship between transportation and economic development. It is universally recognized that capital formation has very direct and positive impact on growth. Transportation is an important component of capital formation.

The historic and most common view about the role of transportation in the development process is that it is a precondition or prerequisite for economic growth. While dealing with the stimulus to the take-off stage of economic growth in the US, Rostow (1964)\textsuperscript{26}, identifies the railroads as the critical investment sector. According to Hunter (1965)\textsuperscript{27}, the economic history of Western Europe and North America has shown that the introduction of modern transportation methods has drastically lowered shipping costs. There is a causal linkage between low-cost transportation and economic development. The industrial revolution was facilitated, among other things, by a prior revolution in transport technology.

A port grows by virtue of the trade it can attract. Its growth is a function not only of technologically related supply facilities but also of the economic and political objectives of a country that determine the demand for port services. The history of port development is often an epitome of changing economic, political and technological circumstances on various scales aided by outward orientation of the economy (Ray 1993)\(^{28}\).

An efficient port raises the productivity of other factors of production (labour and capital) and profitability of the producing units thereby permitting higher levels of output, income and/or employment. For most of the underdeveloped world, the role of port as a policy instrument for both higher mobility and lower transaction cost as well as for spreading the growth centres away from the core metropolitan location has not been utilized so far.

During the last two decades increased globalization and intensified competition in world trade have resulted not only from the liberalization of trade policies but also from significant advances in transport, communication, storage and power facilities. These developments have transformed the traditional organization of production and marketing in order to gain competitive advantage in the international market. The main focus here is on management and transport logistics to achieve efficient utilization of inputs thereby permitting rapid response to emerging facilities.

Thus, the ability of the developing countries to provide the required transport and communication services essential for modern logistics management will increasingly determine their ability to compete for export market and direct foreign investments.

Therefore, the success of economic reform, which is essentially a sort of export-led growth strategy, crucially hinges on the level development and utilization of transport and communication facilities, especially ports.

Against such a background the purpose of this study is to highlight the role port plays in India's regional economic development, and also to find relationship between port performance and overseas traffic.

Jackson²⁹, says that the role of trade in the industrial revolution is generally recognized. By contrast, the contribution of the ports is generally, neglected, while the existence of a specific 'port industry', facilitating the flow of industrial goods, raw materials and foodstuffs, is scarcely noticed and frequently ignored. Although there had been ports from time immemorial, it is fair to say that the 'modern' port was created in England to answer the needs of industrial growth at the end of the eighteenth century. Conversely, it is doubtful, to say the least, whether economic growth of this order could have been sustained without the massive application of capital and recent technical innovations to the removal of physical obstacles inhibiting the speedy receipt and despatch

of shipping. The growth of trade and the renewal of ports were in no small measure, interdependent.

Inoue\textsuperscript{30}, has stated that the port is developed using the public goods and resources of the local community, namely its precious coastal water and land areas. And, in turn, the port generates wider economic and social benefits to the community by creating jobs and providing infrastructure for the region’s economic activities. Unlike other private industries, the port as whole needs to be managed in the interest of the local community.

\textbf{In India}

The National Council of Applied Economic Research\textsuperscript{31} has emphasized the importance of shipping and transport. Transport is an integral part of the production process and therefore has a direct bearing on a country’s economy and development. The very survival of a nation depends fundamentally on the movement of goods it produces and receives in exchange from other nations. In the case of developing countries, international trade is even more closely related to national economic growth than it is in the case of most developed countries. This interrelationship between trade and development can be expected to continue and to remain crucial in the years to come.

Being a service industry shipping is of vital importance to developing maritime countries as they rely heavily on it for exporting their


products and importing their essential requirements. Hence its expansionary and contractionary impacts on trade are of primary significance.

India Ports Report\textsuperscript{32} states that a strong and vast cargo hinterland, which generates large volumes of export and import cargo for the port forms its real backbone of support. The economies of scale that get generated in terms of cargo traffic volumes go a long way in resizing the port infrastructure to match the expected growth in traffic volumes. With strong inland connectivity between the port and its hinterland, the competitive position of the port will be further strengthened.

Giri\textsuperscript{33} says that at the time of independence, West Bengal was well advanced in urbanization compared to India as a whole. Population was dense in the Calcutta region. One of the external factors, which have contributed to urbanization and also urban concentration in West Bengal immediately before independence is the industrial growth, based primarily on export-oriented jute industry. It has taken place around Calcutta because of the port facility, internal river transport network based on Ganges and the railway infrastructure.

Ranade's\textsuperscript{34} analysis reveals that infrastructure development in and around the ports of Western Coast has a positive impact on the traffic handled by Jawaharlal Nehru Port Trust, Mormugoa Port and New

\textsuperscript{34} Prabha Shastri Ranade, "Impact on infrastructure Development on the ports of India’s Western Coast", \textit{Foreign Trade Review}, 37 (3&4) : 6984, 2003.
Mangalore Port. The value and volume of the traffic handled by these ports have increased. With the improvement in infrastructure facilities for handling the specialized cargo, the import and export of liquid bulk cargo have significantly increased. The impact is most remarkable in case of Jawaharlal Nehru Port Trust where the exports have increased at a higher rate than the imports. Kongan railway has relieved the congestion at the Mumbai Port. With infrastructure development at ports and improvement in goods traffic handled by Kongan railway in the course of time, traffic at these ports will be further augmented.

**Cochin Port**

Some important studies on performance of Cochin Port are found useful for the present study. They are reviewed here.

Port literature in India is mainly in the form of reports by committees appointed by the government for specific purposes relating to one or more of Indian Ports. Most of these reports were mainly technical in nature and none of these looks into the entire working economics of any port, or for that matter, presents any detailed traffic survey of the port concerned.

The study by Pankajakshan (1963), on Cochin port is based on the detailed particulars of 612 steamers working at the Port of Cochin during 1960-61. The study estimates the rates of output in cargo handling at the port during 1960-61 and compares it with those of the

---


36 Ibid.
earlier years. It also provides an alternative estimate of the Ports performance using the data regarding the 'average turn-round time' of the vessels calling at Cochin. The main conclusions of the study are: (1) that the average out turn of cargo handling at the Port of Cochin was 9.05 tonnes per hour per hook (crane or ships derrick), during 1960-61; (2) that the rate of cargo handling was about 18 per cent higher when the steamers were berthed in the stream than when berthed alongside the wharf; (3) that the rate of output during day shifts was about 17 per cent higher, than during night shifts; (4) that the hourly out turn of bulk cargo was 26 per cent more, and that of other cargo 81 per cent more than the corresponding output rates in handling general cargo at the port; (5) that between 1955 and 1961, there was a decline of about 15 per cent in the output rate in cargo handling at the Port; and (6) that considering the turn round time of vessels, the output of work per steamer – day at Cochin declined by about 19 per cent between 1954-55 and 1960-61.

Johri and Agarwal37, dealing with the labour productivity in the major ports of India have covered the Port of Cochin from the period 1954-1966. Using three types of measures, viz., the overall port efficiency as measured by the turn round time of ships, cargo handled per unit of labour and the direct labour cost of cargo handling, they measured labour productivity. Their study reveals that labour productivity has been generally falling in the Indian ports. They further observe that the 'incentive scheme's' introduced in the Indian ports are the only cause of

improving efficiency. The incentive schemes in the 'post decasulisation' period, that is, the period after the port workers were decasualized (only casual workers existed before) in the port has not proved to be effective. Regarding the port efficiency measured in terms of the turn round time of ships, the authors could not arrive at any concrete conclusions. Their specific enquiry on Cochin Port reveals that the ATRT increased from 3.3 days in 1963-64 to 4.14 days in 1965-66, after the shore labour was put on an incentive scheme, but has ceased to rise since the stevedore labour has become piece rated.

The study also gives an interesting picture of the TAT. Even though the number of ships visiting the port of Cochin increased from 1039 in 1957-58 to 1219 in 1958-59 and to 1469 in 1963-64, the ATRT has gone down from 5.62 days in 1957-58 to 4.82 days in 1958-59 and to 3.13 days in 1963-64. Regarding the rate of cargo handling at Cochin Port, they conclude that the output data per gang shift do not reveal any clear overall trend. The trend in output per shift for bulk shore and stevedore labour has been going up since 1959, the year in which the incentive scheme was introduced. The rise is more distinct after 1962-63 due to decasualisation and introduction of incentive schemes to the stevedore workers. When workers on both ship and shore were engaged on 'piece rates', output handled per man-shift started rising faster. Yet another finding of their study is that the high rate of idle time reduces the output per man-shift; and also the 'avoidable idle time' is as high as 80 to 90 per cent of total idle time. This avoidable idle time refers to the period of no or
slow work arising due to cargo not ready for shipment, frequent breakdown of cranes and so on. Thus they argue that, if the idle or unproductive time is reduced, the labour productivity can be raised. In their study, the labour cost per tonne of cargo handled does not show any definite trend, but they give clear indication for the rise in labour productivity over the years.

Anilkumar\(^{38}\) examines the causes for the declining trends in the port activities with the following objectives;

1. To trace the evolution of the natural conditions and the man made facilities for Cochin Port to emerge as one of the major ports in India in a historical perspective with a view to documenting the forces which influenced the growth pattern.

2. To analyse the structure of growth and pattern of development of Cochin port in terms of output trends and the trends in the factors of production of the port in the last one and a half decade (1971 to 1986).

3. To carry out a comprehensive analysis of the performance of the port, in terms of both operational and financial indicators.

4. To analyse the performance of port in terms of productivity (both partial and total), capacity utilization and hence to examine its implications on the growth of the port.

He concludes that the performance of Cochin port is generally unsatisfactory in the period 1971 to 1986. The main reason is the lack of investment in modern cargo handling equipments. The unhealthy labour relations that existed during the early 80s is also an important factor for the decline of the traffic through the port. The present state of affairs may be improved by investment in the latest cargo handling equipments, (such as granty cranes etc). Also removing the fear of

displacement of work forces due to the technological or any kind of mechanismization will solve the labour problems prevailing at the port.

**Tuticorin port**

Only a few studies are available on Tuticorin Port. They are reviewed below.

Tuticorin had the advantage of a natural harbour for small crafts of those days by being enclosed by a circular chain of islands and reefs. Father Martin (1700) says, "As you approach it from the sea, Tuticorin appears as a handsome town to those who arrive at by sea".

"The overall share of Indian Ships in the carriage of the country's overseas trade has increased gradually over the years, with the progressive expansion of the natural fleet. Nevertheless, the Indian flag ships carryout 41% of the trade at present. We are still paying out to foreign ships a substantial amount of foreign exchange by way of freight in the carriage of the overseas trade".

Brown and Dove state that the design and layout of ports, cargo handling methods and control, safety measure, passenger traffic working are some of the important aspects in connection with port operation and administration.

Ilangoavan has pointed out that the Port of Tuticorin plays a vital role in sustaining and promoting the growth of various industries in

---

and around Tuticorin. Important industries are Southern Petrochemical Industries Corporation Limited (SPIC), the giant fertilizer unit in the whole of South East Asia and its sister concern Tuticorin Alkali and Chemicals, the 1050 MW Tuticorin Thermal Power Station, the major contributor of thermal energy to Tamilnadu, Heavy Water Project, a unit under the Department of Atomic Energy, Dharangadhara Chemical Works, a pioneer in soda ash production in the country, Sterlite Industries Copper Smelter Plant, Kilburn Chemicals, Southern Fuels Limited and Madura Coats. Apart from that, the port also serves as a major outlet to the export of salt, sea food, dry flowers, country medicines, palmyra fibre. The port handles about 1,50,000 tonnes of urea for SPIC, four million tonnes of coal (which accounts for nearly 55 per cent of total cargo of the port) for the Tuticorin Thermal Power Station. Two lakh tonnes of cashew are handled. Tuticorin, the second largest producer of salt in the country, also plays a leading role in the export.

Southern Petro Chemical Industries Corporation (SPIC) is one of the Asia's' biggest fertilizer plants located in Tuticorin. At its initial stage, an urea reactor of size 3m (dia) x 35m (length) weighing 350T, from Japan was unloaded from the ship "M.V. Fairmast" in Berth No. 3, of V.O.C. Wharf on 16-01-1993. This has greatly added to the growth of Tuticorin Port in recent years.

44 The Editor, "Handling of 350 MT Urea Reactor at the Port", The Bridge, 1(1) : 15, 1993.
Agarwal\textsuperscript{45} stated that Tuticorin Port was helpful in bringing heavy equipments for the Rs. 13171 crore Kudankulam Nuclear Power Project, constructed under the co-operation agreement with the Russian Federation. The charted ships bring the equipment and material directly from St. Petersburg Port in Russian Federation to Tuticorin port. This not only avoids transhipment on the way, but also saves considerable time in material reaching India. He further stated that two shipments containing nearly 15000 freight tonnes of equipments have arrived at Tuticorin Port. It is expected that around 6 to 8 more such shipments, including heavy lifts, over dimensional cargo will arrive at Tuticorin Port during the year. For the project, nearly 300000 freight tonnes of cargo are expected to come over a period of 4 years i.e. till 2006.

According to Pandian\textsuperscript{46}, Tuticorin port has a long history with so many landmark events. Sadly this port at the southern end of India has been neglected for want of political manoeuvres and perhaps tactics. Only after liberalization of the economy in 1991, international attention is drawn to Tuticorin.

Further, in the hinterland of Tuticorin there is a shift in production from the traditional products to various other products. The entrepreneurs have to be prepared to complete with multinational corporations through improvement in technology. There is an opportunity for opening up in European and Australian sector in addition to the

traditional sectors. Therefore, the objectives of every entrepreneur should be to produce and provide goods and services of international quality at competitive prices and identify and penetrate into the potential global markets vigorously and the port in Tuticorin has to grow in its capacity accordingly.

Dorairaj\textsuperscript{47} says that with the Tuticorin Port, occupying a strategic location is poised to become a hub port. As several key industries in both public and private sectors are coming up in various parts of the district, Tuticorin is fast developing into a modern, highly industrial centre. Industrial development of 11 blocks in Tuticorin district proves this point beyond any doubt and that brings the importance of the port for sustaining the pace of growth of the region.

According to Machendranathan\textsuperscript{48} an analysis of the historical development of ports in general shows three main strategies for the development of ports. The first and important strategy is to develop industries in proximity so that the raw materials required for these industries could be imported and their end products could be exported through the port. The development of industries in the hinterland has contributed significantly to the growth of the ports of Vizag, Mumbai, Chennai, Kandla and to some extent the relatively smaller ports such as Mangalore, Cochin and Tuticorin. Since crude and petroleum products form a major portion of the sea cargo, locating a refinery near a port has been given necessary thrust for the development of many ports in India.

\textsuperscript{47} S. Dorairaj, \textit{The Hindu}, Jan 1\textsuperscript{st} 1998, p.A.

\textsuperscript{48} S. Machendranathan, "Land's End Port Looking Up", \textit{The Hindu} 15\textsuperscript{th} April 1997, p.8.
The second strategy is the development of forward storage port, similar to the one in Amsterdam and Singapore. In this case, the port caters not only to the requirements of the hinterland but also to all the nearby countries. In India there has been no serious attempt to develop such a port. The third strategy which is the most appropriate for ports with an undeveloped hinterland is to develop the port into a hub for handling container traffic. The progress in containerization has forced many Indian Ports to look at this strategy more seriously and therefore, the race for developing the first Indian hub port is on.

Machendranathan\(^{49}\) suggests that the Port of Tuticorin should follow a policy of developing its facilities so as to meet the demands of the industrial units coming up in the region and to cash in on its advantages with reference to container handling. The guidelines of the Government of India regarding privatization of port infrastructure has come in quite handy for its development and to overcome major constraints. The efficiency of the port and the involvement of the trade in its operations are added advantages. It is, therefore, not surprising that there is a sense of optimism in shipping and port circles over the current developments and the future growth of the Tuticorin port.

Joy's\(^{50}\) analysis shows that the industrial relations scenario in the study unit is fairly cordial, positive and peaceful. The main contribution to this situation is coming from both the management and the

\(^{49}\) Ibid, p.8.

workforce. Even the tiny irritants in the labour management relations are easily surmounted with a little more vision on the part of the management and a little more amount of the pragmatism on the part of the labour and union leadership.

Joy derived the following conclusions from her analysis. The level of participation of the employees in the training programmes of Tuticorin Port Trust seems to be rather poor, particularly there is total absence of women employees participating in such programmes. Training is not education; while education makes a person think, training makes him act. What is required is ability to act effectively so that not only the productivity of the employee improves but his morale is kept high with all its positive impact on cardinal industrial relations. The reason for this situation is the serious lack of motivation on the part of the workers to participate in the training programmes of the management. This, in turn, is due to the fact that the employee is given promotion by seniority; once an employee gets into Port, he or she can be assured of his or her promotion when the senior moves up. Hence, it is suggested that the employees should be motivated to acquire new skills or update the existing skills through training by way of assigning considerable weightage to training at the time of promotion of the employee. Women, in particular, should be educated on the importance of training in the career advancement and skill development.
Economic Efficiency of Ports

Rangachari\textsuperscript{51} observes that the objectives of a port authority can be stated as maximisation of efficiency in handling ships and cargo while at the same time ensuring a reasonable return on the investment in the port, after paying its dues including taxes and interest and after providing for depreciation at replacement cost. Economic efficiency implies that ports must also be prevented from making too much profit since this would be to the detriment of the country's trade.

De\textsuperscript{52} has developed a composite index (PPI) to measure performance efficiency of ports based on eight different performance indicators. They are

(i). Ship turn round time (TRT)
(ii). Pre-berthing waiting time (PBWT) and
(iii). Percentage of idle time at berth to time at working berth (PITTWB) : Asset Performance Indicators
(iv). Output per ship berth day (OSBD)
(v). Berth throughput rate (BTR), and
(vi). Berth occupancy rate (BOR); and Financial Performance Indicators
(vii). Operating surplus per ton of cargo handled (PTOS) and
(viii). Rate of return on turnover (RRT).

The basic definitions of these performance indicators are given below

\textsuperscript{52} Prabir De, "Performance of Indian Ports", \textit{Indian Ports}, 3(2) : 5-8, 1998.
1. Ship Turn Round Time (TRT) is the duration of the vessel's stay in port and is calculated from the time of arrival to the time of departure.

2. Pre-Berthing Waiting time (PBWT) means the time that a ship waits before getting entry into a berth.

3. Percentage of Idle Time at Berth to Time at Working Berth (PITTWB) is the ratio of total idle time and total working time while a ship enters in the port.

4. Output per ship Berth Day (OSBD) means total tonnage handled, or distributed over the total number of ship berth days.

5. Berth Throughput Rate (BTR) means total cargo handled by a berth in a port.

6. Berth Occupancy Rate (BOR) is the time which a berth is occupied by ships.

7. Operating Surplus per ton of Cargo Handled (PTOS) derives from total operating surplus divided by total tonnage of cargo handled by the port.

8. Rate of Return on Turnover (RRT) derives from operating surplus divided by operating income of a port.

The basic limitation of the conventional method of construction of PPI is that while combining the performance indicators they either give subjective ad hoc weights to different indicators to vary over time and space, assignment of equal or whimsical ad hoc weights could lead to unwarranted results. To overcome this limitation, they have employed well-known branch of multivariate technique of 'factor analysis' for which follows the 'principal component analysis' (PCA) (Fruchter, 1967).
Operational Efficiency

NPC Research Division\textsuperscript{53} studied the performance of Indian Ports. They point out that:

The two main components of the operational efficiency of a port are its employees' performance and the efficiency in equipment use.

Partial productivity indices are the average products of the respective factors of production (labour and capital).

The volume of output, the numerator of the ratio, is dependent upon factors such as labour and capital employed, the state of technology, organizational characteristics, the scale of operations, the degree of capacity utilization, changes in demand, competition, relative factor prices, and also external factors of various kinds.

Labour productivity is the ratio between output and labour input. In the present study we measure both output and labour in physical terms, i.e. output is measured as cargo handled in lakh tonnes and labour input in terms of total number of employees. A more meaningful picture of the trends in labour productivity can be obtained from the disaggregated data on labour input (e.g. shore and casual labour) and also output (e.g. break-bulk cargo, POL cargo, containerized cargo). The efficiency in capital use is captured through the measurement of capital productivity and capital intensity of the port concerned. The capital stock is measured in terms of the value of net block (excluding the work in progress) following the perpetual inventory method. For purpose of the present study, following Banerji (1975), we took the net block of capital assets as the book value.

\textsuperscript{53} NPC Research Division, “Performance of Indian Ports”, \textit{Productivity} 32(2) : 330-331, 1992.
The Total Factor Productivity (TFP) has been defined as the ratio of output to a weighted combination of labour and capital, the weights being the shares respectively of capital and labour in value added. Value, added by the port has been defined as the sum of the wages and salaries, depreciation, gross surplus and finance and miscellaneous incomes. For purposes of estimating the TFP in ports we have taken value added as the output, and the share of labour is calculated as the share of wages and salaries in value added. The share of capital is calculated by subtracting the labour share from unity. This implies the assumption of constant return to scale in the port operations.

While its physical performance can be measured by the conventional productivity ratios based on the methodology followed in the case of a firm, the general measures of efficiency of the port can be analyzed by the more specific port efficiency indicators.

**Port Specific Measures**

The conventional measure of productivity viz., output per unit of inputs is adequate to capture port's efficiency due to its specificity in terms of nature of activities. The output per worker also does not convey the efficiency fully as the average daily employment differs with the level of output. This leads us to use specific port performance indicators such as the average productivity per effective hook hour, average output per man shift, turn round time, etc.

The TRT is defined as the time taken by the vessel to enter the yard, load and unload and also return to the main channel.
Eventhough the TRT is influenced by many other factors like the berthing and mechanical facilities available, co-ordination and supervision within the port etc., labour efficiency is its most important determinant. Therefore, the trends in TRT can be taken as an indication of the corresponding labour efficiency in cargo handling operations.

Concepts

The above review of past studies helped in defining important concepts for the study. They are stated below:

Berths
A facility with which a port is equipped so that a ship can come alongside masonry structure at the shore line for direct loading and unloading operations. A dockside facility for handling anchored ships.

Break-Bulk Cargo
Non-bulk cargo that is not containerized.

Carrier
Person or firm engaged in the business of transporting goods from place to place by land, sea or air.

Container
ISO shipping container. A box like transport equipment usually measuring 20' x 8' x 8½' made of steel, capable of being stowed on ship or transported by rail or truck.

Dredging
Removal, using dredgers, of accumulated silt from channels or berths to maintain sufficient depth or water for passage or berthing of ships.

Floating Craft
A boat or vessel free to move about anywhere within the harbour as needed.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floating</td>
<td>Crane mounted on a floating craft for operation midstream.</td>
</tr>
<tr>
<td>Harbour</td>
<td>A place on a sea shore where ships or boats or other seafaring vessels can halt, protected from the elements, and load or unload cargo.</td>
</tr>
<tr>
<td>Institutions</td>
<td>The term institutions refer to all those arrangements, both formal and informal, that define, facilitate and give shape to human interaction. Both contract and custom, for instance, are referring as institutions in the literature on New Institutional Economics (NIE).</td>
</tr>
<tr>
<td>Jetty</td>
<td>A small pier in a harbour where usually country craft are berthed and handled.</td>
</tr>
<tr>
<td>Pilotage</td>
<td>The act of safely bringing seafaring vessels through the navigation channel from the open sea into the harbour and vice versa, performed by pilots who are functionaries entrusted with this task, usually by the port authority. Also refers to fees payable for the service.</td>
</tr>
<tr>
<td>Ports</td>
<td>As distinguished from the harbour it is the 'interface' at which water and land transport modes come into contact for the interchange of cargo and passengers.</td>
</tr>
<tr>
<td>Port Trust</td>
<td>Agency responsible for the control and management of a port(s) and its facility</td>
</tr>
<tr>
<td>Productive</td>
<td>Productive efficiency here is identified with &quot;cargo handing&quot; efficiency and the cargoes taken into account are general cargoes. This is because general cargoes require labour intensive handling and are affected by</td>
</tr>
</tbody>
</table>
changes in technology and they account for the bulk of the traffic in value terms and thus are most relevant to discussion of efficiency related issues

**Public Port Authority**
The most preferred from is that of Public Port Authority (PPA) of which there are many variants, with varying degrees of autonomy. In India the central government owns the ports, but governs them through port trust

**Technical Efficiency**
A state where output is produced with the least cost combination of inputs.

**Throughput**
The amount of cargo passing through a cargo handling operation at berth, terminal, port or container depot

**Transhipment**
The complete activity of off-loading cargo from one ship, handling ashore and reloading into another ship. More simply, the transfer of cargo from one ship (or other conveyance) to another.

**Profile of Tuticorin Port Trust**

Before ending this chapter, an objective profile of the Tuticorin Port and the Port Trust is presented to serve as a backdrop for the study.

**Introduction**

As portals of both international and domestic trade, ports constitute the basic infrastructure for economic development. Ports play

---

a vital role in building up the economy of India, as more than 90% of the
exports move by maritime. Among the major ports of India, Tuticorin Port
purposively selected for this study.

Location

Tuticorin Port Trust is located at Tuticorin of Tuticorin district, which was carved out of Tirunelveli district in 1986. Tuticorin is located in
the extreme South Eastern corner of Tamilnadu. Its total area is 4621 Sq.
Kms., and has a population of 15,65,743 persons as per 2001 census
report. The largest thermal power station of Tamilnadu, is located at
Tuticorin or Thoothukudi. The district contributes much to the state and
the country as a whole in the production of salt accounting for 70% of the
total salt production of the state and 30% of the requirements of the
country. The district has two industrial estates one at Kovilpatti with 11
units managed by Small Industries Development Corporation (SIDCO) and
the other at Tuticorin with 20 units managed by Small Industries Promotion
Corporation of Tamilnadu (SIPCOT). Small Scale Industries such as
match industries, food-based and metal-based industries are generally
centrated in Kovilpatti and Tuticorin taluks. The production of
readymade garments is flourishing in recent times. About 2,200 registered
small scale industries in the district are engaged in the production of cotton
and staple yarn, caustic soda, PVC resin, fertilizers, soda-ash,
carbon dioxide gas in liquid form etc. Southern Petro Chemical Industries
Corporation (SPIC), Tuticorin Alkalic Chemicals (TAC), Dharangadhara
Chemical Works (DCW), Loyal Textiles Ltd., Madura Coats Ltd., Sterlite
Copper Industries, Kilburn Chemicals, Ramesh Flowers, Nila Sea Foods, Deva and Co., and Transworld Granite Industries are the major industries here besides the public sector undertakings like the Thoothukudi Thermal Power Station Unit (TTPS), Heavy Water Plant (HWP) and Port Turst.

**History of Port Trust**

The history of the existing Tuticorin Port goes as far back as to A.D. 123. Ptolemy of Greece described Tuticorin as a flourishing centre of maritime trade with western and eastern countries. The Port was in existence from the times of the Pandyan Kings. The decay and fall of the ancient ports of Korkai and Kayal due to silting of sand from the Thamiraparani River gave Tuticorin a position of importance even in those days. Maritime trade expanded in Tuticorin Port during the reign of the East India Company. The rebirth of Tuticorin as a port of major importance is a matter of recent history, arising largely from the increase in cotton trade in this region.

Tuticorin is ideally located and sheltered against the onslaught of cyclones by Sri Lanka in the east and Adams Strait in the north east. It faces a calm and tranquil sea with a tidal range of one metre. The first pier of the Tuticorin Port was constructed in the year 1863 and today the existing port of Tuticorin is the largest Intermediate Port in India handling over one million tonnes of cargo per annum. However, the port is an open roadstead situated 9 Km off-shore to the east of Hare Island in deeper waters and the cargo is handled by lighters plying between ship and shore which involves wastage of time and material.
Hence the idea of developing this Minor Port into a major harbour with all facilities was conceived in 1920. On the instructions of the Government of Madras, Sir Wolfe Barry Lyster and partners investigated the prospects of the development of the port and reported to the Government that Tuticorin had great possibilities arising from the physical advantages of its location and future trade prospects. Based on their recommendations, Sir Robert Bristow was appointed Harbour Engineer to prepare detailed estimates and plans. In 1922, Sir Bristow formulated a new proposal called the Bristow Scheme to construct the harbour off the Hare Island. Later, the Government of Madras appointed an Expert Committee, known as the Palmer Committee to examine the project of Sir Robert Bristow and they suggested construction of the harbour at the inner end of the present foreshore after reclaiming 200 acres. In 1929, the Tuticorin Port Trust decided to implement the Palmer Committee Scheme, but the Government was not prepared to provide money. In 1954, the Government of India appointed Shri Chatterjee to carry out investigations for developing Tuticorin into a 20 ft. draft harbour and this scheme, too what was estimated to cost Rs. 4.5 crore, was not taken up. In 1955, the development was referred to the Sethusamudram Canal Project Committee under the chairmanship of Sir A. Ramaswamy Mudaliar and this Committee too urged the implementation of the project. In 1958, the Government of India constituted the Intermediate Ports Development Committee and this Committee, after reviewing the various schemes, submitted its report in 1960 recommending the development of Tuticorin into a Deep Sea.
Harbour. The Government of India accepted the recommendations of the Intermediate Ports Development Committee and decided to construct a Deep Sea Harbour off Hare Island, 9 Kms south-east of the existing Minor Port, which was found to be the ideal location for the construction of harbour with minimum cost. Towards the end of 1966, a doubt was raised about the financial viability of the new port as the quantum of traffic estimated was small. The Government appointed an Expert Committee again to study in detail the pros and cons of the scheme. Based on the recommendations of the Expert Committee, the Government cleared the project in 1968 for Rs. 24.40 crore and the work commenced.

The port is an artificial deep sea harbour with rubble mound type parallel break waters, north and south, including the eastern arm with a length of 4086 M, and 3876 M respectively, 1275 M apart and projecting into the sea with an entrance of 122M, width enclosing an area of 960 acres of sea. The north break-water at Tuticorin will be the longest break-water in the World extending to 13,407 feet (4086M).

Tuticorin has a rich hinterland comprising the districts of Madurai, Kanyakumari, Ramanathapuram, Tirunelveli and the Southern Taluks of Tiruchirappalli, totaling 16,000 Sq. Miles (vide Fig 2). The port is well connected by roads, radiating to all the important places and railway lines in these four districts.

**Tuticorin – A Maritime Centre**

Maritime transportation has been considered the life-blood of world trade since time immemorial. Tuticorin has been a centre of
maritime trade and pearl fishery for centuries as is evident from history. The importance of Tuticorin was realized in the early years of 19\textsuperscript{th} century. The English people induced by the presence of the rich populous hinterland and prospering maritime trade and the advantageous position which Tuticorin had over other ports in possessing a natural harbour.

In the early 20\textsuperscript{th} century, Tuticorin became the citadel of the freedom struggle. V.O.Chidambaranar, sowed the seeds of independence and nationalism in India. He started, in 1906, the first Swadesi Steam Navigation Company in India, in Tuticorin.

After independence, the minor port of Tuticorin witnessed a flourishing trade, it handled a variety of cargoes meant for the neighbouring countries of Sri Lanka, Maldives and the Coastal regions of India. To increase the trade further through Tuticorin, the Government of India sanctioned the construction of an all weather port at Tuticorin. Tuticorin port joined the family of major ports on 11\textsuperscript{th} July 1974. Tuticorin port was declared as the 10\textsuperscript{th} Indian Major Port. On 1\textsuperscript{st} April 1979, the erstwhile Tuticorin Minor Port and the newly constructed Tuticorin Major Port were merged and the Tuticorin Port Trust was constituted under the Major Port Trust Act, 1963. Since then, the Tuticorin Port Trust has had two wings - Zone-A, the Major Port and Zone-B, the erstwhile Minor Port, now called the extension Port\textsuperscript{55}.

Fig 2

HINTERLAND AREA OF TUTICORIN PORT
Physical and Marine Features

The Port has wider water and land area to carry on Port services smoothly and efficiently, with a water spread area of 388.80 hectares at Zone-A, and 14.70 hectares at Zone-B. Similarly the land area allowed at Zone-A is 870.75 hectares and 148.13 hectares at Zone-B.

Climate

The normal temperature ranges from 85° F to 102° F during summer and 70° F to 82° F during winter.

Rainfall

The average rainfall per annum is mainly from North East Monsoon. On an average there are 34 rainy days in a year. So the Port is an all weather Port and the Port is functioning throughout the year.

Wind

The Tuticorin Port lies outside the track of normal cyclone. The wind speed in km. per hour during North East Monsoon is 28 to 36 (from October to December) and 32 to 39 speed in km. per hour during South West Monsoon from (June to September).

Tidal Ranges

The tidal ranges in the high water and low waters are very low. The water just rippling across the height of which reaches 1m to 1.2m during North East Monsoon. The minimum Tide ranges are 0.7m to 0.05m and maximum Tide ranges are 1.1m to 0.07m. (m-metre=100cm.)
Infrastructure Facilities

The volume and pattern of traffic, which decide the quantum of revenue, depend upon the infrastructure facilities such as Berths, Cargo handling equipments, Flotilla, Warehouse facilities etc.

Berthing Facilities

Presently four berths are available at VOC wharf, viz. two berths with transit sheds to handle vessels which require covered storage facilities like raw cashew, wheat, cement etc., and two open berths to handle cargo like coal, copper concentrate, sulphur fertilizers etc. in addition to that two more open berths are available as additional berths to handle timber logs, ilmenite sand and other general cargo. One multipurpose berth is available exclusively to handle containers. Besides two more, general cargo berths are available at shallow water berth to handle small vessel and VCM (Vinyl Chloride Monomer) tanker. With the commissioning of the 8th berth, the berth facility of the Port is further augmented.

Two coal jetties are available at North Break-Water, with adequate modern facilities to handle coal to TTPS (Tuticorin Thermal Power Station) at the rate of 2000 tones per hour through conveyer belt. The oil jetty constructed in the North Break-Water provides facilities to handle upto 40000 DWT (Dead Weight Tonnage) tankers. One finger jetty available at South Break-Water was constructed to handle passenger ships and VCM tankers.

Zone-B is lighter age port having adequate facilities of ligheters of varying capacity between the anchorage and shore. It has the
facilities to handle seven lakhs tonnes of dry cargo per annum. It has three jetties to handle coal, cement, salt etc. and three wharves for salt, fertilizer and general cargo traffic. Following completion of dredging work at Zone-A, the liter age operation at Zone-B has come to a standstill.

**Cargo Handling Equipments**

In Tuticorin Port modern sophisticated equipments are provided in sufficient numbers with different capacities for quick movement of loading or unloading of cargo either from the ship to shore or shore to ship.
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of the Berth</th>
<th>Type of Berth</th>
<th>Designed Act. Depth (Mtrs)</th>
<th>Quay Length (MTrs)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>BERTH 1</td>
<td>Alongside</td>
<td>8.24</td>
<td>168</td>
<td>Transit Shed Provided (Break Bulk)</td>
</tr>
<tr>
<td>2.</td>
<td>BERTH 2</td>
<td>Alongside</td>
<td>8.24</td>
<td>168</td>
<td>Transit Shed Provided (Break Bulk)</td>
</tr>
<tr>
<td>3.</td>
<td>BERTH 3</td>
<td>Alongside</td>
<td>10.70</td>
<td>192</td>
<td>Open (Break Bulk / Dry Bulk)</td>
</tr>
<tr>
<td>4.</td>
<td>BERTH 4</td>
<td>Alongside</td>
<td>10.70</td>
<td>192</td>
<td>Open (Break Bulk / Dry Bulk)</td>
</tr>
<tr>
<td>5.</td>
<td>BERTH 5 &amp; 6</td>
<td>Alongside</td>
<td>8.24</td>
<td>168</td>
<td>Open (Break Bulk / Container)</td>
</tr>
<tr>
<td>6.</td>
<td>BERTH 7</td>
<td>Alongside</td>
<td>10.70</td>
<td>370</td>
<td>Handed over to PSA – SICAL</td>
</tr>
<tr>
<td>7.</td>
<td>BERTH 8</td>
<td>Alongside</td>
<td>7.0</td>
<td>340</td>
<td>Open (General Cargo, Bulk Cargo, Furnace Oil)</td>
</tr>
<tr>
<td>8.</td>
<td>Shallow Draught BERTH-I</td>
<td>Alongside</td>
<td>5.85</td>
<td>115</td>
<td>Open Birth</td>
</tr>
<tr>
<td>9.</td>
<td>Shallow Draught BERTH-II</td>
<td>Alongside</td>
<td>5.85</td>
<td>66</td>
<td>Open Birth</td>
</tr>
<tr>
<td>10.</td>
<td>Passenger Jetty</td>
<td>Alongside</td>
<td>4.50</td>
<td>100</td>
<td>Passenger Terminal Building is Provided</td>
</tr>
<tr>
<td>11.</td>
<td>Oil Jetty</td>
<td>Jetty Type</td>
<td>10.70</td>
<td>228</td>
<td>-</td>
</tr>
<tr>
<td>12.</td>
<td>Coal Jetty-I</td>
<td>Jetty Type</td>
<td>10.70</td>
<td>225</td>
<td>Shore reception, Hoppers Provided</td>
</tr>
<tr>
<td>13.</td>
<td>Coal Jetty-II</td>
<td>Jetty Type</td>
<td>10.70</td>
<td>225</td>
<td>Shore Reception</td>
</tr>
</tbody>
</table>

Source: Traffic Department, Tuticorin Port Trust
Table: 2. – The Cargo Handling Equipments at Tuticorin Port 2001 – 2002

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Number</th>
<th>Rated Capacity (Tones)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mobile Cranes</td>
<td>2 Nos.</td>
<td>75 T @ 3.5 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 No.</td>
<td>12 T @ 3.5 m</td>
</tr>
<tr>
<td>2.</td>
<td>Wharf Cranes</td>
<td>3 Nos.</td>
<td>3 T @ 23 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Nos.</td>
<td>6 T @ 23 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 No.</td>
<td>10 T @ 23 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 Grab</td>
<td>4 T @ 23 m</td>
</tr>
<tr>
<td>3.</td>
<td>Fork Lift Trucks</td>
<td>3 Nos.</td>
<td>3 T</td>
</tr>
<tr>
<td>4.</td>
<td>Pay Loaders</td>
<td>1 No.</td>
<td>23 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 No.</td>
<td>3.1 m</td>
</tr>
<tr>
<td>5.</td>
<td>Top Lift Trucks</td>
<td>4 Nos.</td>
<td>35 T</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 No</td>
<td>25 T</td>
</tr>
<tr>
<td>6.</td>
<td>Vessel Gantry Cranes</td>
<td>2 Nos.</td>
<td>40 T</td>
</tr>
<tr>
<td>7.</td>
<td>Yard Gantry Cranes</td>
<td>4 Nos.</td>
<td>35 T</td>
</tr>
<tr>
<td>8.</td>
<td>Loco</td>
<td>1 No</td>
<td>1500 MT</td>
</tr>
</tbody>
</table>

Source: Traffic Department, Tuticorin Port Trust

Floating Crafts

The floating crafts are very essential for berthing, sailing and mooring of ships. They are also required for rendering bunkering services and marine survey. The Tuticorin Port Trust has 7 tugs, 2 launches and 2 barges.

Warehouse Facilities

The Tuticorin Port Trust provides adequate modern storage facilities in the Port area. Facilities for storing dangerous cargoes and fumigation of imported cotton also exit at this Port. The storage provided in Zone-A and Zone-B is shown in the following table.
Table: 3. - Storage Facilities at Tuticorin Port 2001 - 2002

<table>
<thead>
<tr>
<th>Total Nos.</th>
<th>Storage Facilities</th>
<th>Zone - A (Area SQ Mtrs)</th>
<th>Zone - B (Area SQ Mtrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Ware Houses (Covered)</td>
<td>15550</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Transit Shed</td>
<td>10880</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>Dangerous Cargo Shed</td>
<td>733</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>Fumigatorium</td>
<td>1</td>
<td>739</td>
</tr>
<tr>
<td></td>
<td>Open Platform</td>
<td>25000</td>
<td>15700</td>
</tr>
<tr>
<td></td>
<td>Dutiable Cargo Shed</td>
<td>500</td>
<td>-</td>
</tr>
</tbody>
</table>

*Source: Traffic Department, Tuticorin Port Trust*

A well equipped Port Fire Service Unit and Central Industrial Security Force are functioning in the Port. Navigational aids such as lighthouse, buoys etc. are provided in the Port. The signal station in the port facilitates the communication between the ship and the shore.

**Transport**

The port railway is connected to Southern Railway System. It operates in the port area facilitating the inward and outward movement of cargo. The port is also linked with National Highways, Transport links to and from Tuticorin\(^{56}\) are;

**(i) Road**

Tuticorin port is well connected to various trading centres within Tamilnadu and the neighbouring states of Kerala, Karnataka and Andhra Pradesh by National / State Highways. Regular Bus Services are available to several major cities throughout South India.

\(^{56}\) Shipping times, "Tuticorin Port one of the finest and fast developing Ports . . . .", logistics '97 special, 14(232) : 36, 1997.
(ii) Rail

The port is linked to the broad guage railway system of the country. There are daily express train services between Tuticorin and Chennai, Tuticorin and Bangalore and other connecting trains to Madurai.

(iii) Air

Tuticorin is connected by air to other major cities via Madurai and Trivandrum. Journey by road from Tuticorin to Madurai takes 3 hours and Trivandrum 4 hours. Tuticorin is expected to be air linked soon after the newly commissioned Air Port is served by regular flight service.

ISO 9001 / 2000 – Certificate of Approval

Tuticorin was the first Indian Port certified under ISO 9002 / 94 standards during 1996. This certificate had been renewed for a further period upto 14\textsuperscript{th} December, 2003. In the mean time, the ISO standards were revised on 15\textsuperscript{th} December, 2000 and it was mandatory to switch over to the new standard by 14-12-2003.

Accordingly, the Quality Management System of Tuticorin Port Trust has been assessed and approved in accordance with the requirements of ISO 9001 – 2000 with respect to the following scope: “Providing Seaport Facilities and Related Support Services for Sea Borne Transportation” (with no exclusions). The assessment was made by Indian Registrar of Quality System and the certificate was issued on 23rd April 2003. The validity of the certificate is upto 28th March 2006 subject to surveillance audits every year. The quality policy of Tuticorin Port Trust is as follows: “Ensure Customer satisfaction through continual improvement of facilities and services for maritime trade at optimum cost”. Scope: “Providing Sea Port Facilities and Related support Services for Sea borne Transportation.”
Milestones

It is now the 30th year since Tuticorin Port was declared as Major Port. In these 30 years it has crossed many milestones. The important milestones in the history of Tuticorin are given below:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Declaration of Tuticorin as a Major Port</td>
<td>11-07-1974</td>
</tr>
<tr>
<td>2.</td>
<td>Commissioning of the Oil Mooring Berth</td>
<td>13-07-1974</td>
</tr>
<tr>
<td>3.</td>
<td>Commissioning of first two alongside berths</td>
<td>02-12-1975</td>
</tr>
<tr>
<td>4.</td>
<td>Commissioning of 3rd and 4th alongside berths</td>
<td>31-12-1976</td>
</tr>
<tr>
<td>5.</td>
<td>Constitution of Port Trust Board</td>
<td>01-04-1979</td>
</tr>
<tr>
<td>7.</td>
<td>Commissioning of Coal Jetty – I</td>
<td>01-03-1983</td>
</tr>
<tr>
<td>8.</td>
<td>Commissioning of 5th alongside berth (AB-I)</td>
<td>05-09-1983</td>
</tr>
<tr>
<td>9.</td>
<td>Commissioning of 6th alongside berth (AB-II)</td>
<td>01-01-1984</td>
</tr>
<tr>
<td>11.</td>
<td>Certification under ISO 9002</td>
<td>12-03-1996</td>
</tr>
<tr>
<td>13.</td>
<td>Licensing out berth # 7 to PSA – SICAL</td>
<td>15-07-1998</td>
</tr>
<tr>
<td>14.</td>
<td>Commissioning of alongside berth # 7</td>
<td>05-09-1998</td>
</tr>
<tr>
<td>15.</td>
<td>Sanctioning of capital dredging project by Govt. of India</td>
<td>02-07-1998</td>
</tr>
<tr>
<td>17.</td>
<td>Completion of shallow draught berth</td>
<td>10-05-1999</td>
</tr>
<tr>
<td>18.</td>
<td>Completion of dredging in Harbour basin (11.90m) and approach channel (12.50m)</td>
<td>05-11-1999</td>
</tr>
<tr>
<td>19.</td>
<td>Completion of container terminal for commercial operation at berth # 7</td>
<td>21-12-1999</td>
</tr>
<tr>
<td>20.</td>
<td>Commencement of construction of cargo berth # 8</td>
<td>21-02-2000</td>
</tr>
<tr>
<td>21.</td>
<td>Completion of berth # 8</td>
<td>02-02-2002</td>
</tr>
</tbody>
</table>

Source: Tuticorin Port Trust

Responsibility, Authority and Communication

The functional organization structure and the interrelationship of key personnel concerned with QMS are given below.
Figure - 3
Tuticorin Port Trust
Organisation Chart of TPT
Organization Chart – Cadres of Employees

TM  -  Traffic Manager
DTM -  Deputy Traffic Manager
ATM -  Asst. Traffic Manager
SRO -  Statistical Research Officer
WS  -  Wharf Superintendent
DC  -  Deputy Conservator
HM  -  Harbour Master
ME  -  Mechanical Engineer
AS  -  Asst. Secretary
F & ASO -  Fire & Assistant Safety Officer
CME -  Chief Mechanical Engineer
SE  -  Superintendenting Engineer
EE  -  Executive Engineer
AEE -  Asst. Executive Engineer
AE  -  Assistant Engineer
JAO -  Junior Accounts Officer
EEMM -  Executive Engineer Materials Management
FA & CAO -  Financial Advisor and Chief Accounts Officer
Dy. FA & CAO -  Deputy Financial Advisor and Chief Accounts Officer
CAO -  Cost Accounts Officer
JCAO -  Junior Cost Accounts Officer
AO -  Accounts Officer
CE -  Chief Engineer
SE -  Superintendenting Engineer
SECY. -  Secretary
DS -  Deputy Secretary
AS -  Assistant Secretary
MR -  Management Representative
ISO Cell -  International Organization for Standardization, Cell
Benefits to Accrue

The development of the port is also expected to benefit the state in many ways

- Development of import export intensive industries in the hinter land.
- Increase in the district’s per capita income.
- Increased industrial development.
- To generate income.
- The availability of major port of international dimensions and efficiency.
- Direct and indirect employment generation projected at 1,17,000.
- Increase in tourist revenue to Madurai and other location.
- Backward and forward integration based on the development of these units.

In the latest development of the State Government, the Tuticorin Port Trust (TPT) is likely to play an important role even as the Tuticorin SEZ (South Economic Zone) is expected to boost industrial development in the port city.

The Tuticorin Port Trust (TPT) has started discussions with the State Government, the Tamilnadu Industrial Development Corporation (TIDCO) and the State Industries Promotion Corporation of Tamilnadu (SIPCOT) on the initiatives to be taken up for the Tuticorin SEZ. The Chairman, Tuticorin Port Trust, said that an investor conference is planned to be held in December, and a concept paper on the Tuticorin SEZ would be released shortly.
A senior Tuticorin Port Trust official said, the SEZ should have large industrial units which would not only help increase volumes for the Tuticorin Port but also generate employment for people in and around the port city.

Tuticorin Port in its attempt to carve a niche in the international maritime trade is introducing yet another direct container service to Far East and China. With the introduction of three new mainline services to Europe, Red Sea Ports and now Shanghai and upgradation of Indamex Service to U.S. East Coast, Tuticorin is the best connected to international ports on the East Coast and ranks next to only Jawaharlal Nehru Port Trust in having direct services to a large number of international destinations.

The introduction of the new service will further boost container traffic through Tuticorin Port and transhipment of containers from other Indian Ports through Tuticorin will get a boost with the new service.