A STUDY ON THE INFRASTRUCTURE AND PERFORMANCE OF MAJOR PORTS IN INDIA

Project report submitted for partial fulfilment of the requirement for the degree of

Master Of Business Administration

(PORT AND SHIPPING MANAGEMENT)

Submitted by

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SCHOOL OF MARITIME MANAGEMENT

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CERTIFICATE

This is to certify that, this project report titled THE INFRASTRUCTURE AND PERFORMANCE OF MAJOR PORTS IN INDIA submitted to School of Maritime Management, Indian Maritime University, Cochin Campus by JERIN CHACKO for the partial fulfilment of the requirements for the award of the degree of MASTER IN BUSINESS ADMINISTRATION IN PORT AND SHIPPING MANAGEMENT is a bona fide record of work carried out by him under my guidance.

DATE-March 2023

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DECLARATION

I, **JERIN CHACKO** (Registration No.: 2105304003) student of School of Maritime Management, INDIAN MARITIME UNIVERSITY-COCHIN hereby declares that this project Report titled **THE INFRASTRUCTURE AND PERFORMANCE OF MAJOR PORTS IN INDIA** submitted in partial fulfilment of the Requirement for the degree of **MASTER IN BUSINESS ADMINISTRATION IN PORT AND SHIPPING MANAGEMENT** is my original work carried under the guidance of **AMRITHA CS** Faculty of School of Maritime Management .It has not formed the basis for the award of any degree/diploma or Associate ship of any University/Institution. The information submitted is true and original to the Best of my knowledge.

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EXCLUSIVE SUMMARY

Every nation's success depends on its port infrastructure. The length of India's coastline is roughly 7,500 miles. In terms of volume and value, ports handle nearly 95% and 70%, respectively, of India's exports. Iron ore, coal, crude petroleum, and other vital items are imported via the sea route. There are 205 small ports and 12 big ports along the coast of India. India's ports and shipping sector are essential to the development of the nation's trade and commerce. The sixteenth-largest marine nation in the world is India. The development of the port business is greatly aided by the Indian government. It has enabled 100% FDI on the automated path for port and harbour construction and maintenance projects. Additionally, it has made it simpler for companies to benefit from a 10-year tax cut for building, operating, and maintaining ports, inland waterways, and inland ports.

Both at the regional and national levels, the periodic arrangement of port performance, particularly on logistics elements of the port, needs to be studied. This prompts the researcher to examine the infrastructure and operation of important ports as a case study to understand the traffic performance of important ports in India, to make recommendations to improve the traffic performance in important ports, and to evaluate the infrastructure facilities of important ports in India so that the government attaches priority to expanding infrastructure facilities in the ports.

In accordance with the automatic route, the Indian government has permitted up to 100% of foreign direct investment (FDI) for projects involving the development and upkeep of ports and harbours. Between April 2000 and March 2022, FDI input into Indian ports totaled US$1.63 billion. Enterprises engaged in the business of building, managing, and maintaining ports, inland waterways, and inland ports are granted a 10-year tax exemption. The National Maritime Development Programme (NMDP), a plan to promote the maritime industry with a budgeted investment of US$ 11.8 billion, has also been launched by the government. The Ministry of Shipping

received a total budget of Rs. 1,702.35 crore (US$ 233.48 million) in the Union Budget 2020–21.

The development of technology has made it possible to control ports and terminals in new and improved ways. The world has shifted towards automating all port operations and process flows, which has had a huge impact on how marine trade is done. Additionally, it had a major effect on the employment rate in ports.

CHAPTER-1

INTRODUCTION

1.1 INTRODUCTION TO INDIA AND PORTS

India, a South Asian nation, is the second-most populous nation in terms of total population, the seventh-largest country by total area, and the world's most populous democracy. India has a rich cultural heritage with many different languages, customs, and people. The country's individuality rests in its diversity, and as a result, it has gracefully and easily handled global advances. International firms have been warmly welcomed in India since the 1990s, when the economy was liberalized, but Indians have been cautious and proactive in accepting foreign ideas and skills. On the one hand, modern industry and the professional services sectors are expanding quickly, while Indian communities are proudly embracing farming, enhanced agriculture, and distinctive handicrafts as a profession.

Major Indian ports handled 720.29 million tonnes of cargo traffic in FY22, indicating a CAGR of 2.89% from FY16 to FY22. In FY22, the capacity of India's major ports was 1,598 million tonnes per annum (MTPA). All of India's major ports handled 446.50 million tonnes (MT) of cargo traffic between April and October 2022. All of India's major ports handled 720.29 million tonnes (MT) of cargo in FY22. India's exports of goods was US$ 417.8 billion in FY22, an increase of 40% from the previous year.

Due to a large shift in traffic from the main ports to the non-major ports, non-major ports made up 45% of all cargo traffic at Indian ports in FY22.

The extraordinary economic growth and development of an area depends heavily on ports and shipping. A port can host industrial complexes, neighbourhoods, and warehouses to accommodate growing consumer demands in addition to serving as a gateway between land and the sea. Ports will be essential to many nations' efforts to build harmony among urban areas, industrial complexes, logistical hubs, and market entry points, sometimes known as hinterland servicing. The majority of analysts predict that, compared to the past 100 years, the business environment will change

more quickly in the coming ten years. The business operations of global 2 firms will undergo a significant change as a result of these modifications, particularly in terms of logistics and ports.

The country is attracting several global majors for strategic investments due to the diversity of industries, investment opportunities, and a supportive government. Young people make up the majority of the population, which is a significant number and a good source of workers.

In addition to ordinary cargo, India's marine trade includes export-import trading in a variety of bulk commodities. Since the start of economic liberalisation 10 years ago, there has been a notable increase in the handling of value-added goods, primarily in the form of containerized cargo movement, in numerous Indian ports. The growth of the country's port industry has taken on a lot of new aspects as a result. Interestingly, despite the fact that total cargo growth has been rather spectacular over the past ten years, fresh demands have been made on the port industry to increase cargo handling capacity and build new berths and terminals.

1.2 SIGNIFICANCE OF THE STUDY

An important indicator of a nation's overall growth is the growth of its trade. Trade is a good indicator of a nation's economic health.

A nation may meet the demands of all of its areas through internal trade, which also promotes balanced regional growth. Foreign trade also serves two purposes: it makes available goods that are not produced domestically and allows a nation's surplus goods to be spent. It causes a nation's economy to develop quickly.

Ports act as crucial transportation nodes that ease the transit of commodities to local companies and global markets. Ports can connect goods to consumers through our highway system, railroads, air travel, and domestic marine highways (water transportation routes). These ports

enable the transfer of commodities between the seaports and other settlements. They also include smaller inland and intercoastal ports. Cargo transfers between various forms of transportation are referred to as intermodal transportation.

Ports are thinking about boosting their internal capacity while trade development persists by improving efficiency and making investments in infrastructure to accommodate larger ships. Ports may also collaborate with local governments, Metropolitan Planning Organisations, state and federal Departments of Transportation, and other organisations to increase outside-the-port transportation capacity in order to minimise congestion brought on by restrictions on other forms of transportation.

Seaborne transportation is the most economical and effective means of transportation when compared to other options. Industries require a safe and economical method for importing raw materials and exporting finished items. As a result, the majority of industries worldwide are located along coastlines and close to significant ports. The lives of both direct and indirect beneficiaries are impacted by these industries.

1.3 SCOPE OF THE STUDY

The scope of the study is to identify the impact of the performance and infrastructure of major ports in India towards economy, and various parameters in which it can be measured, correlated and analyzed.

The study is limited to major ports in India and also to the availability of data accessible to public.

1.4 OBJECTIVES OF THE STUDY

- To study the importance of major ports in India.

- To analyse the infrastructure facilities available in major ports in India.
- To analyse the performance of the major ports in India and to suggest the measures to improve the traffic performance of the major ports in India.

1.5 RESEARCH METHEDOLOGY

Type of Research

The type of research design used here is descriptive in nature. It means the detailed explanation of the characteristics of the study.

1.6 DATA COLLECTION

Secondary Data

- Ministry of Ports, Shipping and Waterways official website.
- Books, magazines and newspaper.
- Journals and Articles.
- Official government websites.

Data collected from the above secondary source were used to learn about the infrastructure and performance of major ports of India.

1.7 TOOLS FOR DATA PRESENTATION

The tools used for the research are diagrams, bar graphs line graphs, combined graphs and tables.

1.8 LIMITATIONS OF THE STUDY

The limitations of the research are as follows:

- Sources of collecting data are limited.
- Limited time span of project.
- Some of the data are also not available due to security reasons.
- The research is limited to the availability of data which was not provided from higher officials.

CHAPTER-2

LITERATURE REVIEW

2.1 REVIEW OF LITERATURE

Dr. J. Rengamani and V. Venkatraman "A Study on the Performance of Major Ports in India", International Journal of Management.

The basis of the world economy is international trade. The exchange of goods among nations expands the supply options and guarantees that manufacturing occurs where it is best and cheapest. This is seen in the acceleration of globalisation and the fact that global trade is expanding more quickly than global output. Cheap and secure transportation is essential for global trade. Over 80% of international trade is thought to be handled by maritime transport, which is made possible by technical advancements and low transport costs. The need for maritime transport increases along with the growth of trade. The cost of sea transportation has decreased thanks to technological advancements in bulk and container transport. Ports play a significant part in the overall economic development of India. This is because the majority of the nation's international trade—about 90% by volume and 70% by value—takes place through maritime channels. The fact that excess growth in freight handled (with 8.6% CAGR) surpassed GDP growth (at a 7.6% CAGR) emphasises the significance and growth potential. As a result, there is an inverse relationship between GDP growth and port cargo volume growth. It follows that improving and expanding port infrastructure will be a crucial enabler of the Indian economy's expansion.

The designs took into account the anticipated growth rates since the maritime industry was expanding at a faster rate. Unfortunately, the major global economies have seen declines in every area as a result of the global downturn and recession.

Ports and shipping are not an exception. As a result, cargo traffic, which had been increasing at a pace of about 11% annually, has experienced slower growth.

Although India has effectively survived the slowdown because to the inherent resilience of its economy and systems and to a variety of policy initiatives, recapturing the former growth rates for the economy is still a problem.The Indian economy is expected to grow strongly, according to the current economic data.

Kinjal Patel, Jayesh Juremalani "Development of Satellite Seaports - A new initiative under Sagarmala Project" (2018), The significance of the sea route as a hub of expansion was evident from the beginning of civilisation in India. As a result of population increase, economic growth, urbanisation, and technological advancements, many Indian cities have developed into metropolitan areas. As a result of these changes, the role of seaports has changed, and the current pattern of port development in India places an increasing focus on mixed-use development and recreation.

The objective is to identify the features of port development and, from there, to formulate guidelines for port development. Many studies have emphasised the value of port development in the process of creating a nation. This chance has a favourable effect on economic expansion, which will be reflected in the GDP of the nation. India's geographic location is both vulnerable and strategically important. The Sagar Mala Project is essential because protecting our coastline is our first concern, not protecting our borders. 1)improvement of the port 2) Increased interconnection 3) Industrial development including ports 4) The growth of coastal settlements. India has never placed a high priority on creating a beautiful shoreline, thus the project has a tremendous potential of being successful.

Anindita Mandal, Soma Roychowdhury and Jhumoor Biswas Performance analysis of major ports in India: a quantitative approach , "Due to the economy's rapid growth, India's contribution to world commerce is rising. This puts more pressure on these ports, which

handle a sizable portion of the commerce, to perform at their peak levels. It also contains an evaluation of each port's performance in many areas and a thorough analysis of numerous performance indicators using a variety of statistical techniques. This will enable the ports to evaluate their own effectiveness and pinpoint the reasons for any shortcomings. The next step in the effort is to construct an integrated composite performance index by giving numerous characteristics comparative weights in order to assess the overall performance of various ports. The primary goals of Indian ports are to boost national revenue and provide for the needs of the population through export-import. The creation of a uniform metric to assess the relative standing (as well as absolute standing) of several major ports is long overdue and will aid in the formulation of policy decisions for the enhancement of the port scenario. Generalised performance measures that show operational effectiveness are the foundation of the intercomparison. Different rates and ratios involving performance indicators have been taken into consideration to further standardise the metrics and provide consistency between the performance of various ports so that their performance can be compared.

Jeronimo Guilherme Remigio, "Measuring productivity and efficiency of seaports in India using DEA technique" (2018). Examining about the important ports in the context of commerce and India's key role in the global trade after the start of economic reforms in 1991. It uses actual data to determine the productivity and efficiency of Indian seaports. This study use the DEA technique to assess the effectiveness and productivity of Indian seaports. The DEA statistics, as they are presented and made public in the article, show how Indian ports have performed over time. For the port system in India to serve as a benchmark, this research is insufficient. Instead, it would be advantageous to thoroughly review the operational and financial performance of the Indian ports.

This project created efficiency benchmarks and assessments for the Indian port industry using data envelopment analysis (DEA). Several issues are brought to light as a result of this basic inquiry into India's port industry, which can then be further examined and conclusions reached.

Concerns about productivity and efficiency should be prioritised while evaluating the performance of today's Indian ports.

Natalia Wagner ,ORCID,Izabela Kotowska and Michał Pluciński, "The Impact of Improving the Quality of the Port's Infrastructure on the Shippers' Decisions", Costs of operation, supply security, and chain-wide reduction of carbon emissions are crucial characteristics of a transportation network. Shippers take into account the best option for modes of transportation, carriers, or ports when making managerial decisions on the chain configuration. The operation of the supply chains that seaports support is influenced by their role as transport nodes. Consistent growth in average ship size is a tendency that can be seen in global shipping. Maintaining the competitive position of the port, and therefore of the entire transport chain, requires adapting the port and port access infrastructure to the changes observed in global shipping. A guarantee of supply security for shippers is the knowledge that handling of larger boats is guaranteed regardless of any changeable hydro-meteorological conditions and temporary vessel entrance permits. This study intends to prove the significance of these considerations for cargo shippers' decision-making by illuminating the effects of fairway deepening on port-oriented supply chain costs and security of supply.

Port authorities must make decisions that adapt the port's infrastructure to a variety of factors, including climate change [2], new ship propulsion technologies, and the requirement to maintain a certain degree of competitiveness [3]. Ports are anticipated to be crucial in influencing the existing policy environment of shipping towards its low-carbon transition

[4]. Technology and equipment like cold ironing infrastructure or LNG refuelling infrastructure will be needed for new ships calling at ports [5]. By coordinating energy use and the use of renewable energy sources, port authorities may support energy management [6].

K. ChandrasekharIyer, V.P.S Nihar Nanyam "Technical efficiency analysis of container terminals in India". Despite the abundance of research on the effectiveness of port operations, the most of them come from industrialised nations, with only a small number from emerging nations like India. Indian container ports are crucial because of their ideal location and ability to control transhipment traffic. It is essential to understand how they work at the micro level, particularly at the terminal level as opposed to the port level. In terms of terminal location advantage, administrative control, and private control, the data is interpreted.

It made it possible to rank the effectiveness of various terminals. The efficiency of container terminals operating under big ports is on the decline when compared to that of smaller ports, and those on India's west coast are found to be more efficient than those on its east coast. Additionally, not every container terminal has seen an increase in productivity that is comparable. In terms of relative efficiency and growth in total factor productivity, the Tuticorin container terminal stood out among the other seven high-performing terminals identified during the analysis as being the most consistent. The most significant factor affecting the efficiency of the terminal is revealed to be its size, which provides economies of scale.

CHAPTER-3

INDUSTRY PROFILE

3.1 PORTS

A port is a place on the coast or coastline with one or more harbours where ships can dock and transport passengers or cargo to or from land. A port is a maritime commercial facility which may include one or more wharves where vessels may dock to load and release travelers and cargo.

A port is Port locations are chosen to maximise access to land and navigable water, economic demand, and wind and wave protection. Natural or man-made harbours exist. An artificial harbour may have intentionally constructed breakwaters, sea walls, or jetties, or they may have been built by dredging, and they must be maintained by dredging on a regular basis. A natural harbour, on the other hand, is surrounded on three sides by land features.basically a point where merchandise is exchanged starting with one method of transport then onto the next. Ports are the economic backbone of any country because the bulk of trade occurs there. Seaports continue to be a crucial link for getting to the global business centre. Over the next few decades, it is projected that the amount of goods transported by water would significantly increase.

Ports, particularly international seaports, serve as exchange facilitators for the global economy. Through the skillful and astute development of goods, people, and data, they are important tools of trade policy in the domestic economy and speak to an important interface between nations. Since the beginning of time, ports have served as essential nodes in the global trade network. They are also places where many societies interact and the veil of sway is lowered or raised by goods, information, and people. Additionally, domestic political agents who are accustomed to operating under lax standards of conduct now have access to new opportunities for lease chasing and the revision of client wants thanks to global exchange and venture streams.

More jobs will be created as a result of improved port infrastructure, which will also ease traffic, cut down on pollution, and bring prosperity. The

trading process is driven by supply and demand and the regulatory environment. The trading process requires the backing of trends in governance, economics, and demography.

In addition to providing an overview of ports as a global enterprise, this chapter also provides some insights into the Indian port sector and maritime trade.

In an era of economic globalisation, ports are swiftly moving from their traditional role as suppliers of full coordinating systems to conventional land/ocean interfaces. This means that ports have had to deal with a lot of challenges as a result of bizarre natural shifts and trends in the transportation, port, and coordinating industries.

Ports all over the world have been working to improve their physical infrastructure, particularly container terminals and related facilities, and to expand their port hinterland by offering facilitated free trade zones in an effort to create centre ports and global coordination centres in order to adapt to the challenges and escalating issues.

Companies in this sector run ports and harbours and offer assistance with water transportation, such as cargo processing and ship navigation. The business is concentrated in areas with the highest level of trade since demand for marine help services is closely tied to the creation of goods. The countries with the most notable number of large vessel calls include China, the US, Japan, Singapore, and South Korea.

The first subgroup develops, operates and funds infrastructure. Generally, the State, national or local, owns and develops this foundation to a port in a port authority or equivalent. Infrastructure is typically defined as the land and the permanent assets that configure the site as a working port, for example quay walls, breakwaters and dredged channels.

The second subgroup owns and maintains the superstructure. As a rule, this includes equipment such as cranes and civil engineering services such as electrical supply and paving. The public and private players in this group

are wide and varied, depending on the type of cargo concerned and the national legislative environment.

The private sector participates in the container market by owning or leasing a container terminal, primarily in the form of international shipping organisations. The superstructure is owned and maintained by the private sector in return. In some ports, the superstructure in the form of multi-user container terminals is financed, run, and maintained by the port authority. Similar agreements are made in other cargo modes as well, albeit in bulk transactions private players are more likely to be cargo owners than ship owners.

Service providers make up the vast majority of the port sector's subgroups. All ports provide the same cargo-handling services, including stevedoring, the use of cranes and other handling equipment, and the processing of cargo through customs organisations. Players in this market may include the State as an operator, customs authority, and regulator in the areas of economy, security, navigation, and the environment. International shipping organisations, regional stevedoring businesses, cargo agents, freight forwarders, and labour unions mostly connected to dock labour are other participants.

Ports play a significant role in the transportation sector as a whole and are becoming more interconnected with the global economy. In essence, ports serve as a gateway to the world economy. The movement of people and products is one of the most significant services provided by the shipping industry. This sector also includes extra or basic infrastructure, such as storage and warehousing, maritime cargo handling services, customs clearance services, and various port services (such as pilotage, towing and tug assistance, emergency repairs, anchorage berth and berthing services, and so on).

3. 2 HISTORY OF PORTS

Ancient civilizations that conducted maritime trade frequently built sea ports. In addition to harbour structures, old anchors have also been discovered. Many of these historic locations don't exist today or serve as ports. Ports can stop being used, even in more recent eras.

Modern ports are typically multimodal distribution centres having transit connections via sea, river, canal, road, rail, and air lines. Early ports tended to be simply harbours. Successful ports are positioned to provide the best route to a bustling hinterland.

A port will make it simple for ships to navigate and will provide protection from the wind and waves. Ports are frequently located on estuaries where the water may be shallow and frequent dredging may be necessary. Although they are less frequent, deep water ports like Milford Haven can accommodate larger ships with a deeper draught, including super tankers, post-Panamax vessels, and huge container ships. It is advantageous for other enterprises, such as regional distribution hubs, warehouses and freight forwarders, canneries and other processing facilities, to be situated at or close to a port.

3.3 PORTS IN INDIA

Ports have a key role in the economy and in the provision of services since they act as a hub for the interchange of two different forms of transportation: maritime and land, including any kind of rail or road. The multimodal nature of ports is therefore their most significant characteristic. India's coastline and sea islands have a total of 7517 miles in ports, including 12 major ports and 212 recognised non-major ports.

Gujarat has become the top marine State among the States in terms of port traffic, accounting for 40.5% of all the cargo handled at Indian ports. Furthermore, it is claimed that 67% of the cargo carried by minor ports is

bound towards Gujarat. Gujarat is followed in terms of total port traffic by Maharashtra, Andhra Pradesh, Odisha, and Tamil Nadu, with their respective shares of 13.1%, 13.1%, 11.2%, and 9.5% in terms of all seaborne traffic in India.

Up until 1990, India's economy was closed, but it progressively began to liberalise, privatise, and go global. Aiming to increase export potential, succeeding governments established policies that promoted international trade. India did achieve significant trade growth because to the creation of special economic zones (SEZ) and permitting foreign equity participation to support exports. These initiatives, however, fell short because they did not place enough emphasis on cost effectiveness and infrastructure co-development. Co-development was effectively adopted in China.

Government of India (GoI) has authorised the Sagarmala project, which aims to modernise these ports. India's ports and shipping sector are essential to maintaining the expansion of trade and commerce in the nation.

For port and harbour building and maintenance projects, the Indian government has permitted Foreign Direct Investment (FDI) of up to 100 percent through the automatic route. The National Maritime Development Programme (NMDP), a strategy to improve the maritime industry with a budgeted investment of US$11.8 billion, has also been launched by the government.

The Ministry of Shipping received a total budget of Rs. 1,709.50 crores (US$ 223.31 million) in the Union Budget 2022–23. By 2035, India intends to invest US$ 82 billion in port construction. To promote merchant ship flagging in the nation, the government granted subsidy support totaling Rs. 1,624 crore (US$ 222.74 million) to Indian shipping businesses in 2021. Additionally, the Major Port Authorities Bill, 2020 was adopted by the Indian government. This law seeks to strengthen major port governance excellence and decentralise decision-making.

In contrast to the ports' current capacity of 2,406 MMTPA, assessments done under the Sagarmala Programme predict that cargo volume at ports will reach 2,500 MMTPA by 2025. To accommodate the expanding traffic, a roadmap has been created for boosting the Indian port's capacity to 3,300+ MMTPA by 2025. This comprises new port development, capacity expansion of current ports, and improvements to port operational efficiency. 206 port modernization projects totaling Rs. 78,611 crore ($10.71 billion) are underway. Of which, 59 projects totaling Rs. 24,288 crore (US$ 3.31 billion) are now being executed, and 81 projects worth Rs. 24,113 crore (US$ 3.29 billion) have already been completed.

Major Indian ports handled 720.29 million tonnes of cargo traffic in FY22, indicating a CAGR of 2.89% from FY16 to FY22. In FY22, the capacity of India's major ports was 1,598 million tonnes per annum (MTPA). All of India's major ports handled 446.50 million tonnes (MT) of cargo traffic between April and October 2022. All of India's major ports handled 720.29 million tonnes (MT) of cargo in FY22. India's exports of goods was US$ 417.8 billion in FY22, an increase of 40% from the previous year.

Due to a large shift in traffic from the main ports to the non-major ports, non-major ports made up 45% of all cargo traffic at Indian ports in FY22.

3.4 MAJOR PORTS IN INDIA

Figure 3.1 Major Ports

MAJOR PORTS

Eastern Coast of India –

- Kolkata Port
- Paradip Port
- Visakhapatnam Port
- Ennore port
- Chennai Port
- Tuticorin Port

KOLKATA PORT

The Port of Kolkata, also known as Kolkata Port, is the only riverine major port in India and is situated in Kolkata, West Bengal, some 203 kilometres (126 miles) from the ocean. Its official name is Syama Prasad Mookerjee Port Trust (previously Kolkata Port Trust). The British East India Company built it, making it India's oldest active harbour. Kolkata is a freshwater port where the salinity is constant. The port includes two separate dock systems: the deep water dock at Haldia Dock Complex, Haldia, and the Kolkata Dock at Kolkata.

The only riverine port among the major ports, it can comfortably accommodate ships up to 500 feet in length. The port has 52 berths (KDS - 35 including 6 Oil Jetties and HDC - 17 including 3 Jetties) with an effective rated capacity of 82.57 MTPA to handle a variety of cargo types, including containers. It is one of India's busiest main ports and a significant exporter of tea, leather, iron ore, coal, copper, and steel.

Fig 3.2 Kolkata Port

PARADIP PORT

It is the only prominent port in Odisha and is situated in the Jagatsinghpur neighbourhood. It was constructed where the Mahanadi River and the Bay of Bengal meet. One of India's main ports is called Paradip Port.

The Paradip Port Trust (PPT), India's eighth major port, was commissioned as the nation's first major port on the East Coast on April 18, 1966, after the Indian government took over management of the port from the state government on June 1, 1965. Paradip Port is situated 210 nautical miles south of Kolkata and 260 nautical miles north of Visakhapatnam 34 E at Latitude 200 - 15'58.63 N and Longitude 860 - 40'-27".Ro-Ro Jetty) for different types of freight.

The port has sixteen (16) berths/jetties for diverse cargo types, including three (3) SPM and one (1) Ro-Ro Jetty. It is a large exporter of iron ore and coal.

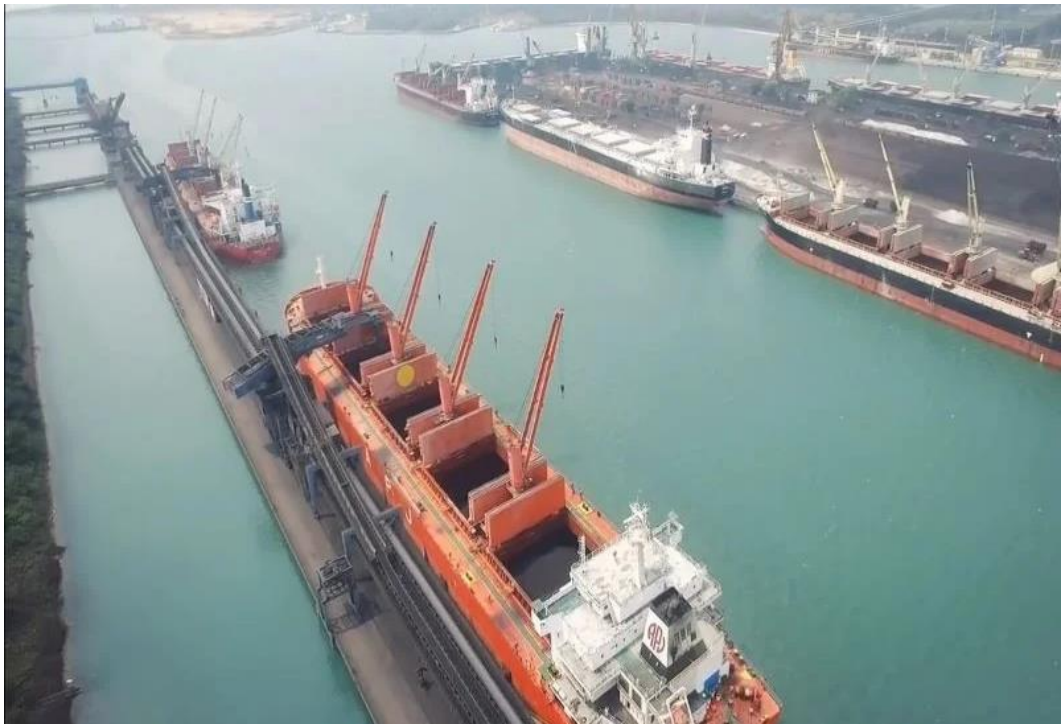

Fig 3.3 Paradip Port

VISAKHAPATNAM PORT

One of the most important ports in India is the port of Visakhapatnam. The port is located at an altitude of 1704'00" north and a longitude of 83023'00" east on the east coast of India, halfway between Chennai and Kolkata. It is in the GMT +5:30 time zone. The port features three harbours, including the fishing harbour, the inner harbour, and the outer harbour. There are 6 berths in the outer harbour, which has a water spread of 200 hectares, and 18 berths in the inner harbour, which has a spread of 100 hectares. Due to its natural deep-water basins, the outer harbour can accommodate ships up to 200,000 DWT and 14.5 metres in draught when the tide is favourable**.**

It is a natural port with deep-water basins created by a steep promontory into the sea, known as Ross Hill to the north of the entrance channel and Dolphin's Nose Hill to the south. The only port in India and fast of its kind in South Asia to have a Cavern facility for LPG – a mined rock Cavern at a depth of 200mtrs. below sea level (capacity: 60,000 T).

Fig 3.4 Vishakhapatnam Port

ENNORE PORT

Kamarajar Port was once known as Ennore Port, which is situated north of Chennai Port. It is the country's only corporate-owned large port and India's first corporate port. The Tamil Nadu Electricity Board's (TNEB) need for thermal coal led to the establishment of Kamarajar Port Limited (KPL), the Ministry of Shipping's 12th Major Port, in 2001. KPL is unique in being the only corporate port among the Major Ports of the Central Government.

Originally only able to handle coal, the port has developed into a multi-cargo facility with the ability to handle liquid bulk, iron ore, autos, and other commodities. The port has 91.00 MTPA capacity and 7 + 1 LNG berths**.**

Fig 3.5 Ennore Port

CHENNAI PORT –

Of India's twelve main ports, Chennai Port is the third oldest at roughly 135 years old. The second-largest container port in the nation, it was formerly known as Madras Port. It is a constructed port. An artificial port open all year round, Chennai Port has two outer and inner harbours, each having a wet dock and a boat basin. It is growing as a key port on India's east coast and has the strategic advantage of having the entirety of South India as its hinterland. At 130 06' N latitude and 800 18' E longitude, the Port of was established in 1875 and is situated on the Bay of Bengal. The Chennai port has 24 berths with a 134.00 MTPA total capacity.

The port with three Docks, 24 berths and draft ranging from 12m to 16.5m has become a hub port for Containers, Cars and Project Cargo in the East Coast. Automobiles, iron ore, coal, granite, petroleum products, and fertilisers are all traded extensively.

Fig 3.6 Chennai Port

TUTICORIN PORT-

It is situated in Tamil Nadu's Thoothukudi District and is also referred to as V.O. Chidambaranar Port. It is a man-made port that mostly handles merchandise going to and coming from Sri Lanka. At latitude 80 45'N and longitude 780 13'E in the Gulf of Mannar, with Sri Lanka on the South East and India's vast landmass on the West, lies the strategically located V.O.

Chidambaranar Port. It is close to the East-West International maritime routes.The port has 15 berths with a rated effective capacity of 111.46 MTPA.The Port is open around-the-clock all year long and is well shielded from storms and cyclonic winds. In this port, goods such as coal, oil, sugar, salt, and petroleum products are exchanged**.**

Fig.3.7 Tuticorin Port

Western Coast of India

The Western Indian coastal plains stretched from Gujarat in the north to Kerala in the south, going through Maharashtra, Karnataka, and Goa. Between the Western Ghats and the Arabian Sea, it is located. It is divided into four coasts: the Kachchh and Kathiawar coast, the Konkan coast, the Kanara coast, and the Malabar coast. The following are the important ports on India's western coast:

- Kandla Port
- Jawaharlal Nehru port
- Mumbai Port

- Mormugao Port
- New Mangalore Port
- Cochin Port

KANDLA PORT-

Kandla is a seaport and town in the Kutch district of Gujarat state in Western India, close to the city of Gandhidham, and is now formally known as the Deendayal Port Authority. It is one of India's principal ports on the west coast and is situated on the Gulf of Kutch. It is located around 430 nautical miles north-northwest of the Port of Mumbai and about 256 nautical miles southeast of the Pakistani port city of Karachi. The main seaport serving western India was built in the 1950s and is known as Kandla Port.

According to the amount of cargo handled, it is India's largest port. In comparison to the 6,492 crore (64,920 million tonnes) handled in 2007-08, the west coast port handled 7,223 crore (72,225 million tonnes) of cargo in 2008-09.

Even though handling crude oil imports, primarily for Nayara Energy's Vadinar refinery in Gujarat, has contributed significantly to this rise, the port is also taking steps to increase non-POL cargo. POL traffic made up 63% of all cargo handled at Kandla Port in the most recent fiscal year, compared to 59% in 2007-2008. The port moved 10.6 crore (106 million) tonnes of cargo in 2015–16.

In accordance with the Indian Ports Act of 1908, Kandla Port was renamed Deendayal Port in 2017.

Fig 3.8 Kandla Port

JAWAHARLAL NEHRU PORT –

The mid-1980s-built and May 26, 1989-commissioned Jawaharlal Nehru Port has advanced significantly to develop into a top-tier international container handling port. It is called the Nhava Sheva Port, and it is situated in the Rajgad district of Maharashtra. On the eastern shore of Mumbai Harbour, it is situated between 180 56'43" North and 720 56'24" East off Elephanta Island. One of the busiest seaports in the nation is there.

The all-weather tidal port of Jawaharlal Nehru has 15 berths and a 138.87 MTPA effective rated capacity. The port has five fully automated container terminals, four of which are run by large international terminal operators like APM, PSA, and DP World under a PPP deal.

Fig 3.9 Jawaharlal Nehru Port

MUMBAI PORT –

It is situated in the Maharashtra state and is also referred to as Bombay Port. It is an organic harbour. One of India's oldest and largest ports is located in Mumbai. Mumbai Port is India's second-oldest significant port after Kolkata. India's main entryway has historically been the port.

Its advantageous position is just one of many. It is gifted with a 400 square km natural deepwater harbour that is shielded on the east by the Konkan mainland and on the west by the island of Mumbai. It is situated halfway down India's west coast. The deep waters of the harbour offer ships enough and secure shelter all through the year. It handles about a quarter of all exports, making it the busiest port in the nation.

Beginning as a general cargo port, Mumbai Port has evolved into a multi-utility port that can handle many kinds of cargo, including break bulk, dry bulk, liquid bulk, and containers. Significant wet and dry dock facilities are provided by the port to meet the requirements of ships using the facility. The port offers 32 different services and facilities, including as pilotage, berthing, storage, and cargo delivery, in addition to auxiliary services like

Container Freight Station (CFS), Port Railways, and maintenance of buildings, equipment, and other structures. The port has a 79.00 MTPA effective rated capacity with 29 berths (including OCT).

Fig 3.10 Mumbai Port

MORMUGAO PORT –

Mormugao Port is located in the town of Mormugao, Goa, India. Its natural harbour, which is open and protected, is located on the southern end of the river Zuari's mouth. A breakwater and a mole that was constructed from the breakwater's outer end and runs parallel to the wharf are also used to safeguard this harbour.

The west coast of India's Mormugao Port has been in use for more than a century. Its infrastructure is highly developed and capable of transporting a wide variety of commodities. It is a mole and a breakwater that defend a natural harbour. The Port is now being deepened to a depth of -19.80 metres from its current level of -14.4 metres. Nine berths are available for use in the port, including six mooring dolphins for handling bulk cargo. 63.40 MTPA is the port's effective rated capacity.

The country's existing rail and road networks provide a cohesive logistic network. A sophisticated Vessel Traffic Management System has been implemented in order to provide reliable modern services. The old VTMS system will be replaced with a new one. There is a dedicated cruise berth 31 and a berth for the use of Navy and Coast Guard. Iron ore, cotton, manganese, and coconut are all exported.

Fig 3.11 Mormugao Port

NEW MANGALORE PORT –

It is situated in Mangalore, Karnataka. It is the deepest inner harbour port along India's eastern coast. New Mangalore Port was officially launched on January 11th, 1975, after being recognised as the 9th Major Port on May 4th, 1974. With 16 berths and 1 SPM Single Point Mooring, the port has a rated capacity of 98.00 MTPA.

It handled 27.60 million tonnes of cargo (as of December 2019) during the 2019–20 fiscal year. Important projects were funded this year, including the PPP-based mechanisation of Berth No. 14 for the processing of containers and other clean goods (Rs. 280.71 crores) and the provision of

PQC pavement for a 2000 square metre area (Rs. 13 crores). Among other goods handled by this port are iron ore, fertilisers, LPG, and petroleum products.

Fig 3.12 New Mangalore Port

COCHIN PORT –

One of the biggest ports in India, Cochin Port is a significant port on the Arabian marine, Laccadive Sea, and Indian Ocean marine route in the city of Kochi. Additionally, it is India's first port for transshipment. The port is located on Willingdon Island and Vallarpadam in the Lake of Kochi, which is where the Fort Kochi river empties into the Laccadive Sea. The largest container transshipment facility in India is the International Container Transshipment Terminal (ICTT), which is a part of the Cochin Port.

There are 21 berths in Cochin Port, one of which is an SPM with a rated capacity of 78.60 MTPA.India's first trans-shipment facility and biggest facility for shipping containers was the International Container Trans-shipment Terminal, also known as Vallarpadam Terminal.

This facility is part of the Port of Cochin. It serves as both a major port for the nation and a hub for shipbuilding in India. It mostly deals with the import and export of agricultural products like coffee, tea, spices, salt, and fertilisers.

The Ernakulam channel maintains a draught of 30 feet and has berthing facilities, allowing the port to receive larger vessels. The Mattancherry waterway maintains a 30 foot draught. Ships may use the port's round-the-clock pilotage services, subject to some size and draught limitations. The hinterland centres located across the states of Kerala, Tamil Nadu, and Karnataka are connected to the Cochin Port by an effective network of roads, trains, waterways, and airways. There are facilities for providing water and bunkering to ships.

Fig 3.13 Cochin Port

TABLE 3.1: List of Major Ports in India

Sl No	Name of the Port	Coast	State
1.	Kandla	Western Coast	Gujarat
2.	Mumbai	Western Coast	Maharashtra
3.	Jawaharlal Nehru	Western Coast	Maharashtra
4.	Marmugoa	Western Coast	Goa
5.	Manglore	Western Coast	Karnataka
6.	Cochin	Western Coast	Kerala
7.	Haldia	Eastern Coast	West Bengal
8.	Paradip	Eastern Coast	Odisha
9.	Vishakapatnam	Eastern Coast	Andhra Pradesh
10.	Chennai	Eastern Coast	Tamil Nadu
11.	Ennore	Eastern Coast	Tamil Nadu
12.	Tutikorin	Eastern Coast	Tamil Nadu

3.5 FEATURES OF PORT

Main function and feature of ports:

- Sea and land access
- Ship berthing infrastructure
- Road and rail link
- Industrial area
- Vehicle control while entering and leaving port
- Environmental control

- Cargo damage control
- Safety and security in the port vicinity
- Immigration, customs, health and medical
- Commercial papers control
- Pilotage, tugging, and mooring arrangement
- Use of berths
- Loading, unloading, and storage
- Cargo distribution

Services and facilities for Ships:

- Arrival and departure
- Navigational aids and Vessel Traffic Services
- Approach channel & Berth
- Pilot Services, Tugs and Mooring arrangements

Services and facilities for Cargo:

- Cargo handling on ship and on quay
- Transfer to/from storage
- Storage/warehousing
- Tallying, marking &weighing
- Surveying & protection
- Customs and documentary control
- Receiving and delivery

For Cargo transfer facilities:

• Opening closing of hatches

• Stowing of cargo

• Connection of manifold

Additional facilities at port:

• Repacking, labelling, sorting, assembling, cleaning and preparing cargo

• Setting up logistic network and packaging unit

• Administrative Control facilities:

• Police, immigration, customs, health, water, provision supply, telephone, repairs, Hospital, waste control, Fire control & port state control.

CHAPTER-4

ANALYSIS AND INTERPRETATION

ANALYSIS AND INTERPRETATION

TABLE 4.1:Showing the cargo traffic at major ports(million tonnes)

CARGO TRAFFIC AT MAJOR PORTS	
FY16	606.37
FY17	647.43
FY18	679.36
FY19	699.35
FY20	704.93
FY21	672.6
FY22	406.98

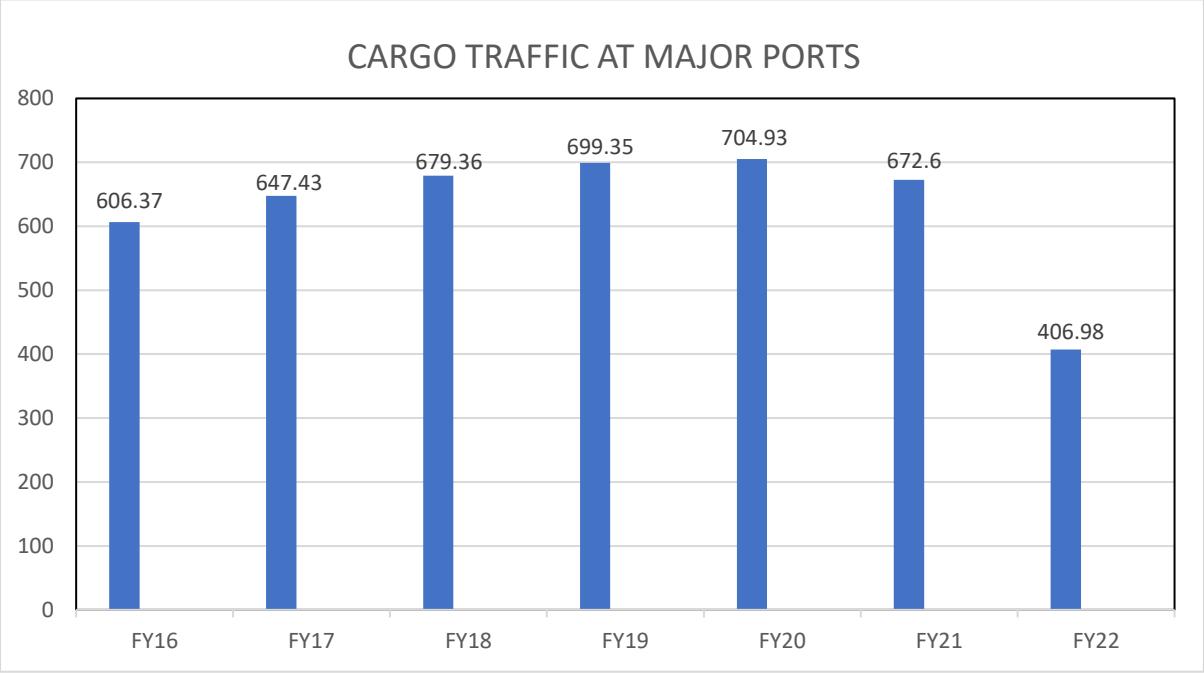

FIGURE 4.1: Showing the cargo traffic at major ports (million tonnes)

INTERPRETATION-

From the above figure we can infer that the cargo traffic performance of major ports in India in FY16 is 606.37 million tonnes.From FY16 to FY20

there were increase in the performance upto 704.93 million tonnes.Then it decreases in the FY21 and in FY22.

TABLE 4.2: Showing the Efficiency of Major Ports with respect to Cargo Handled

MAJOR PORTS (Efficiency)			
Year	No. Ports (Numbers)	Cargo Handled (Million tonnes)	Efficiency Parameter (Million Tonnes)
2010-2011	12	570.09	47.51
2011-2012	12	560.19	46.68
2012-2013	12	545.83	45.49
2013-2014	12	555.49	46.29
2014-2015	12	581.34	48.45
2015-2016	12	605.89	50.49
2016-2017	12	648.47	54.04
2017-2018	12	679.47	56.62
2018-2019	12	699.17	58.26
2019-2020	12	704.93	58.74

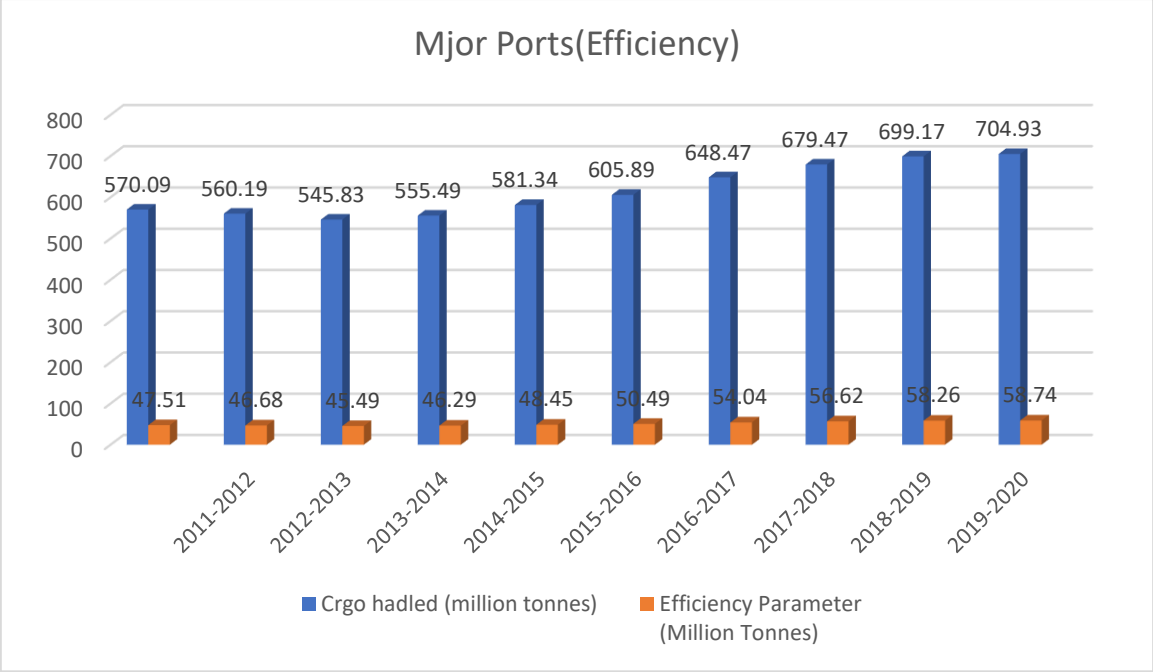

FIGURE 4.2: Showing the Efficiency of Major ports with respect to cargo handled

INTERPRETATION-

We may deduce from the above table that in the years 2010–11 and 2013–14, the port's efficiency was calculated to be 47.51 and 46.29 respectively. Thereafter, there is a progressive reduction. Since then, it has experienced a sharp rise in the years that have followed, reaching 58.74 million tonnes in the years 2019–20. This leads us to the conclusion that the volume of cargo handled in large ports has increased significantly.

TABLE 4.3: Showing the container traffic of Major ports in terms of TEUs

MAJOR PORTS (Container Traffic in TEUs)			
Year	**No.of ports**	**Containers (`000 TEUs)**	**(`000 Tonnes)**
2010-11	12	7561	114158
2011-12	12	7651	120276
2012-13	12	7714	119866

2013-14	12	7714	114672
2014-15	12	7960	119441
2015-16	12	8146	123168
2016-17	12	8442	124663
2017-18	12	9138	133726
2018-19	12	9877	145523
2019-20	12	9892	146861

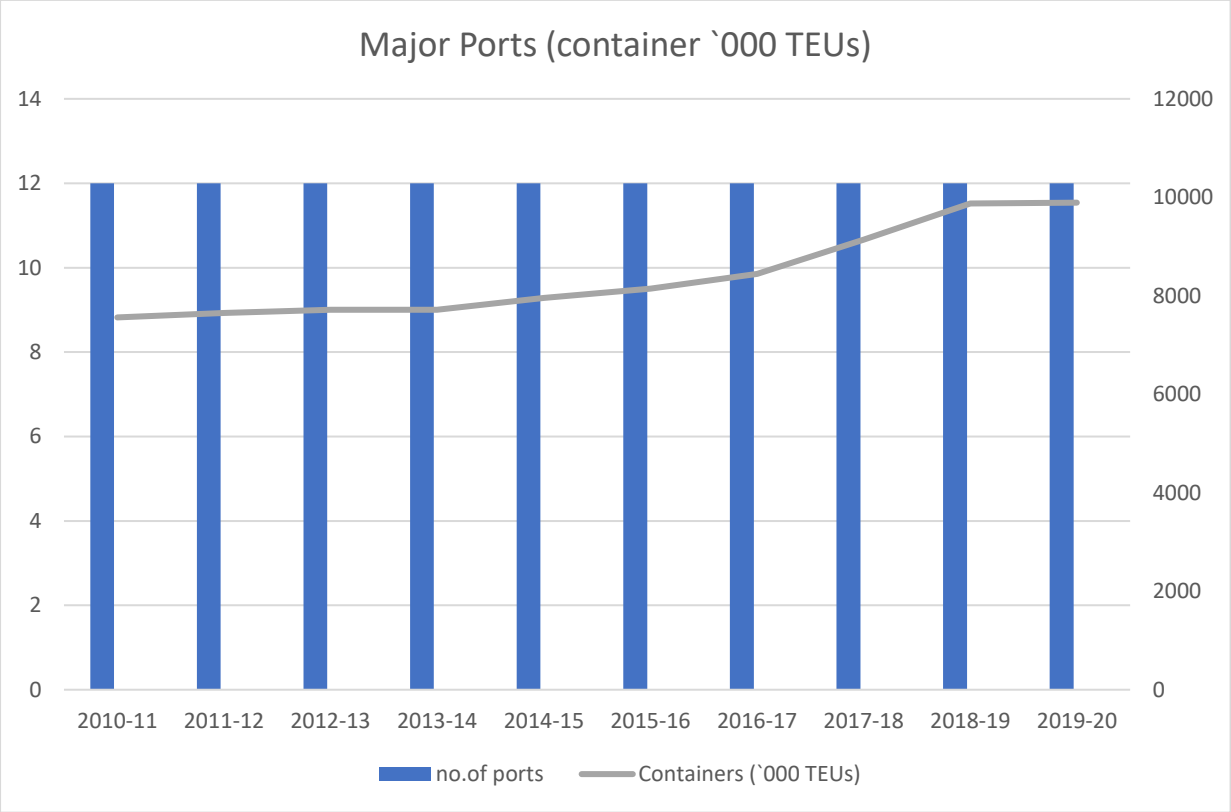

FIGURE 4.3: Showing the Container traffic of Major Ports in terms of TEUs

INTERPRETATION-

From the above table we can infer that the container traffic in the major ports is having a gradual increase from 2010 – 11 and during the year 2012– 13 and 2013 – 14 the container traffic in TEUs is remaining constant.

Since then, the container traffic is having a significant increase and reached up to 98,92,000 in the year 2019- 20**.**

TABLE 4.4: Showing the Passenger traffic of

Major ports

MAJOR PORTS (Passenger Traffic)	
Year	Passenger Traffic(`000no s)
2010-11	344
2011-12	465
2012-13	408
2013-14	368
2014-15	220
2015-16	408
2016-17	473
2017-18	422
2018-19	522
2019-20	710
2020-21	44

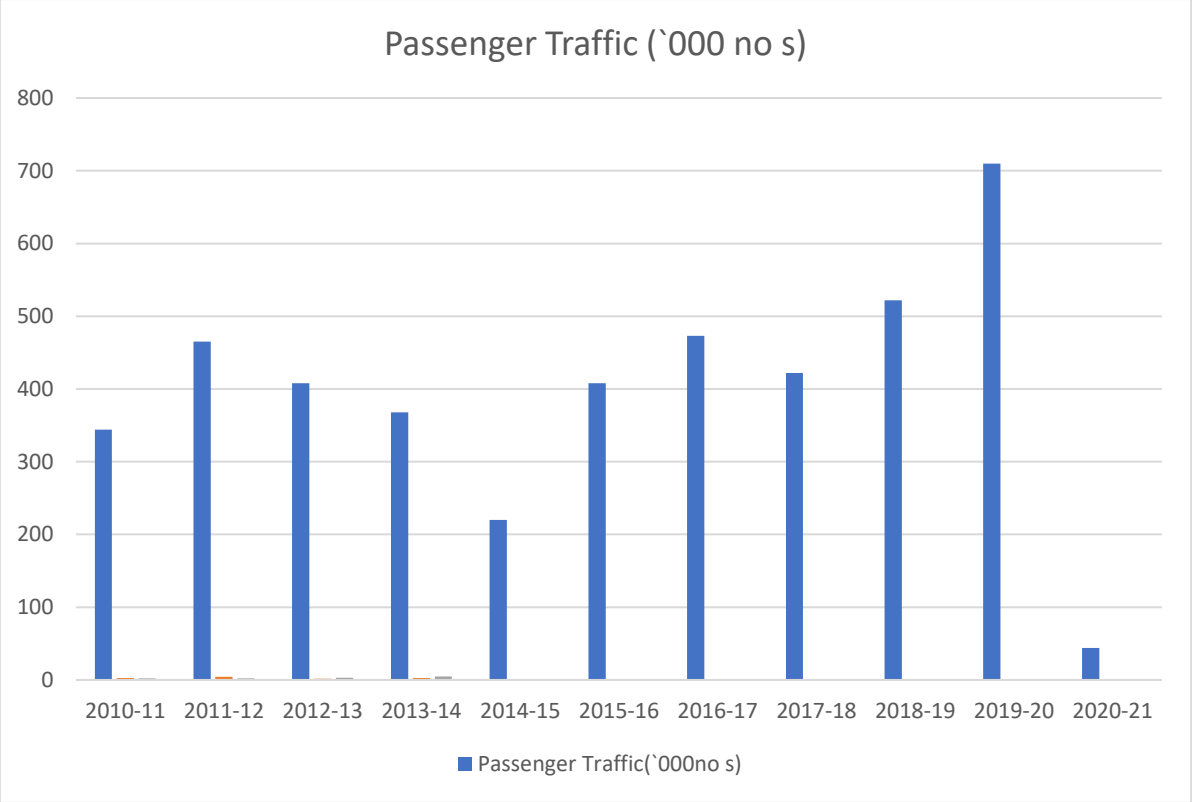

FIGURE 4.4: Showing the Passenger traffic of Major Ports

INTERPRETATION-

From the above table we can infer that the passenger traffic in Major ports is projected as 3,44,000 in the year 2010 – 11 and it is having a tremendous increase in the next year and then a decline in the upcoming years and fall down to 220,000 in the year 2014 – 15. Since then, it rose again till 2016 – 17 and again had a fall in the very next year. From 2017 – 18 onwards passenger traffic is having a impeccable increase and reached 710,000 in 2019 –20. Major Indian ports saw passenger traffic of roughly 44,000 at the conclusion of the fiscal year 2021. During the time period under discussion, this was the lowest passenger volume.

TABLE 4.5: Showing the Financial Performance of Major Ports

MAJOR PORTS (Financial Performance)			
YEAR	Total Revenue in (TR)(in millions)	Total Expenditure (TE)(in millions)	(TE/TR*100)
2010-11	80084	70431	87.95
2011-12	92672	83299	89.89
2012-13	99560	94446	94.86
2013-14	100854	98566	97.73
2014-15	103464	93462	90.33
2015-16	126811	10662	84.08
2016-17	135520	106383	78.50
2017-18	149242	122350	81.98
2018-19	153918	130375	84.70
2019-20	162629	117944	72.52

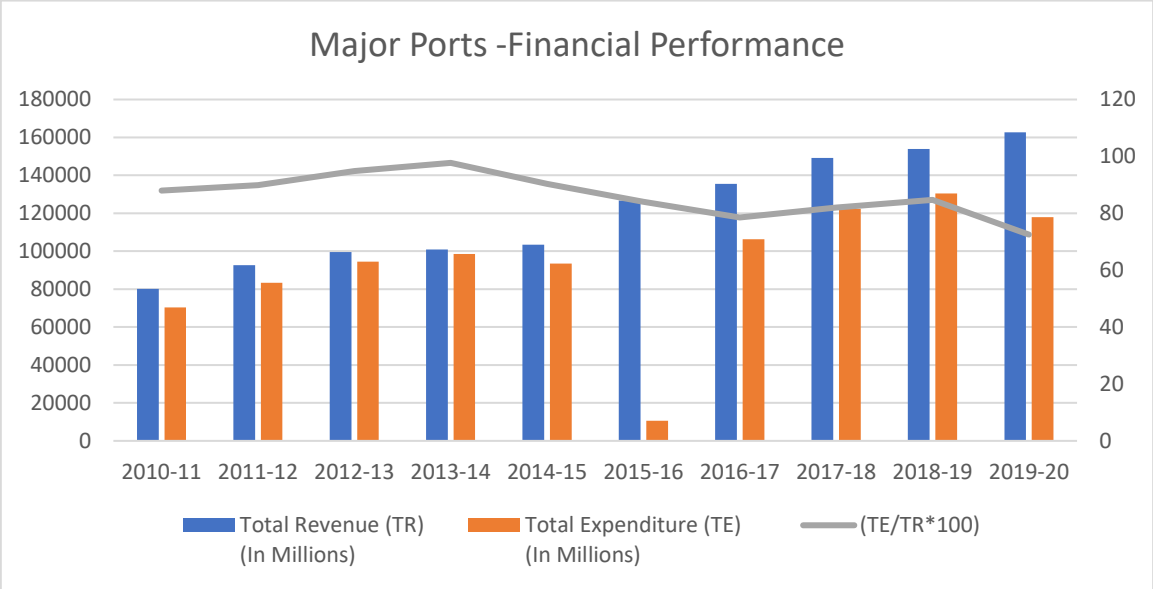

FIGURE 4.5: Showing the Financial Performance of Major Ports

INTERPRETATION-

From the above data, we can infer that the Total revenue is having a tremendous increase throughout the span of 10 years, but Total expenditure is having a rise in the initial nine years of research but in the 2019- 20 the expenditure is falling down. From the percentage analysis we can conclude that the expenditure to revenue ratio is fluctuating throughout the span of nine years but it is having a great fall (72.52 %) in the 2019 - 20 when compared with other years of study.

TABLE 4.6: Showing the Employment of Major ports

MAJOR PORTS (Employment)	
Year	**Employment ('000 No. s)**
2010-11	53
2011-12	53
2012-13	52
2013-14	45
2014-15	42
2015-16	38
2016-17	35
2017-18	32
2018-19	29
2019-20	26

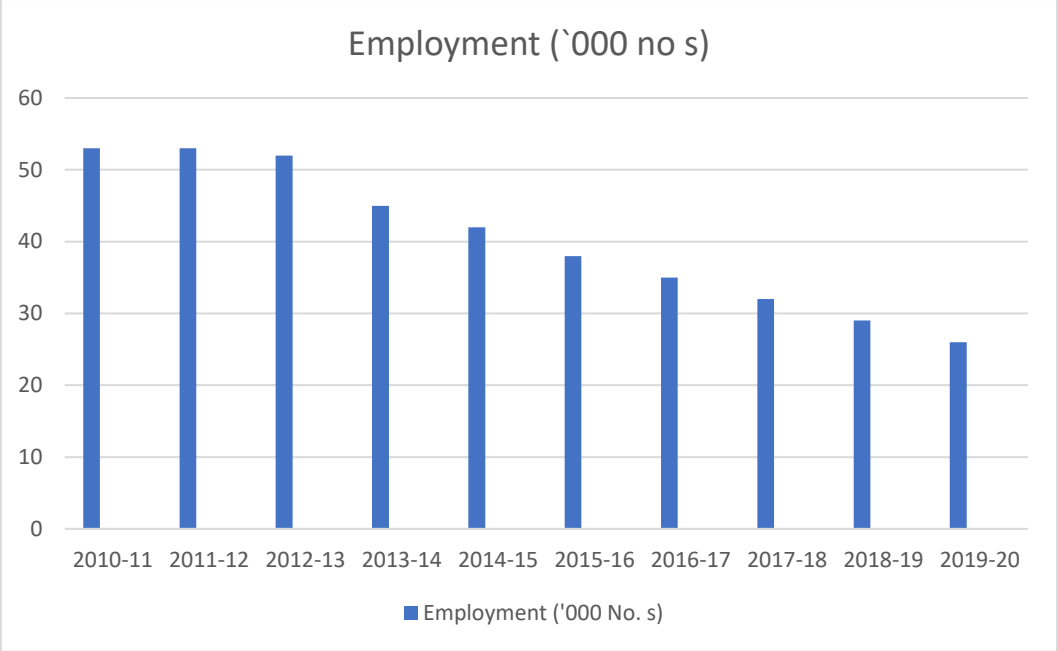

FIGURE 4.6: Showing the Employment of Major ports

INTERPRETATION-

From the above table we can infer that, in the year 2010 -11, 2011 -12 the employment rate was 53,000 and then it declined gradually and reached 26,000 in the year 2019 -20. Therefore, we can conclude that in a span of 10 years the direct employment got reduced drastically but at the same time due to the advent of technology indirect employment has been generated in the same manner.

CHAPTER -5

CONCLUSION

CONCLUSION

The study on the infrastructure and performance of major ports in India is to identify the impact of the performance and infrastructure of major ports in India towards economy, and various parameters in which it can be measured, correlated and analysed. Thus, we the researcher has concluded the study and projected below the finding and summary of the same.

5.1 SUMMARY OF FINDINGS

- Major and ports of India is having a significant impact on Economy of the country by the advancement of infrastructure and performance, as it is clearly visible from the study conducted by the researcher.

- Trade is facilitated by the numerous ports, both large and small, that line the Indian coastlines. There are 200 smaller ports in addition to 12 major ports. Seaways account for 95% of India's international trade and 70% of its value.

- The researcher had an analysis on the efficiency parameter of cargo handled by major ports in India and concluded that the major port is having a great efficiency in terms of cargo handling.

- It is clear from the analysis that major ports handle a significant rise of 21.17% more container TEUs than they did ten years ago in terms of total containers handled.

- In the analysis of major ports in India we can notice a significant rise in passenger traffic of 51.54 % .

- The study discovered a shift from direct to indirect work as a result of technological advancements, which is clearly demonstrated by the loss in employment during a ten-year period in major ports. On the other hand, it is also clear that in small ports, they were able to maintain the workforce for a period of ten years.

- In terms of the financial performance of Total Expenditure to Total Revenue by percentage analysis, we can deduce that over the course of a decade, the percent of expense incurred is decreasing due to technological advancement, an increase in the volume of cargo handled, and various strategies used to lower the expense incurred.

5.2 SUGGESTIONS

- We have determined from the analysis that more infrastructure and labour force are needed to handle the tsunami of cargo in order to expand the cargo handling capacity of ports. To allow for the berthing of huge ships, port infrastructure must be expanded, and draught must also be raised.

- Major ports are experiencing a decline in employment, but minor ports have experienced a more or less consistent rate of employment over a ten-year period. It is clear that there has been a shift in employment from direct to indirect, but if more work possibilities have been made available, this will ultimately raise people's standards of living and help the economy flourish.

- It is very important to increasing the port infrastructure because, the port infrastructure serves as the foundation for port operations that support passing ships, goods, and people. Port infrastructure development necessitates capital-intensive expenditures, a lengthy planning horizon, and long-term planning.

- Better to improve the efficiency and cargo handling in the ports ,and increasing the number of ports in the country can develop our economy.

- Most Indian ports lack the necessary machinery to handle large volumes. Additionally, many ports lack adequate IT systems, facilities, and navigational aids. Consider these measures for all ports in the country.

- There would be a larger surplus than there is now if effective strategies and procedures for containing overall expenditures had been devised. Therefore, it would be wise to develop fresh strategies and directives to reduce the costs incurred that were anticipated during the researcher's investigation.

5.3 CONCLUSION

A port is a location where ships can dock on a coast or land. There may be one or multiple harbours in ports. Additionally, they are used to move goods and people to and from land. Indian ports should improve the quality of port services offered and the multimodal infrastructure that can efficiently handle the containerized international trade from door to door in order to make them more desirable and cost-effective for their clients.

There are additional requirements that ports must meet in order to invest in or advertise their capacities, depending on which shipping lines utilise the port. The availability of storage space, the accessibility and skill of dockworkers, the choice of logistics service providers serving the port, connectivity to inland carriers and terminal operator responsiveness to special requests, the provision of adequate, timely information, the standard of maritime services (pilotage, mooring), prompt vessel turnaround, invoice accuracy, and port security are some of them.

India has effectively survived the slowdown because to the inherent resilience of its economy and systems and to a variety of policy initiatives, recapturing the former growth rates for the economy is still a problem.The present economic statistics unmistakably indicate that the Indian economy is growing rapidly.

By considering the above said suggestions the economic parameters considered for the analysis like cargo handled, passenger traffic, container traffic, employment rate, financial performance can have a significant effect which in turn can have a tremendous impact on economy and trade. All these suggestions need to be adopted with certain ground strategies which can enhance the people, profit and planet.

Technology development has led to the development of new and better methods for controlling ports and terminals. The way marine trade is conducted has undergone significant changes as a result of the global trend towards automating all process flows and operations in ports. Additionally, it significantly affected how many people were employed in ports.

All employees are aware of the fundamental technique to adapt for technological advancement, thus suitable instruction and awareness must be given in order to do so. Later, through these restructuring, a variety of elements may have an impact on the implementation, which may be analysed and reviewed in order to overcome those challenges and increase productivity and efficiency for the economy and trade.

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