A STUDY ON STATE WISE PORT TRAFFIC IN INDIAN PORTS

Submitted to the School of Maritime Management, Indian Maritime University

inpartial fulfillment for the award of degree in

MBA INTERNATIONAL TRANSPORTATION AND LOGISTICS MANAGEMENT

Submitted

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DECLARATION

I, Ankitha Sundaran (Reg No 2103305009), student of School of Maritime Management, Indian Maritime University –Chennai Campus, hereby declare that this project report titled **A STUDY ON STATE WISE PORT TRAFFIC IN INDIAN PORTS** submitted in partial fulfillment of the requirement for the degree of Master of Business Administration in International Transportation and Logistics Management is my original work carried under the guidance of my project guide.

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CERTIFICATE

This is to certify that the project report entitled "**A STUDY ON STATE WISE PORT TRAFFIC IN INDIAN PORTS)**", submitted to the School of Maritime Management, Indian Maritime University, Chennai Campus., in partial fulfillment for the award of the degree of Master of Business Administration in Port & Shipping Management, is a record of work carried out by **Ankitha Sundaran,** Reg. No. **2103305009**

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CHAPTER 1

1. INTRODUCTION

A port can be defined as any area or harbor that can provide shelter to various boats and vessels and can allow the period or constant transportation of shipments. Ports are vitally important to the marine industry. They not only help the industry but also aid the communities in which they reside. Many are well-equipped with specialized fixtures to deal with cargoes (forklifts and cranes). Ports promote the welfare and trade of the country

Seaport is a ship and shore interface or maritime inter modal interface as the world economy is highly dependent on sea borne trade and includes the usual places where ships wait for their turn. The term port means gate or gateway. ports are vital gateways, linking its transport corridors to the rest of the world. Customs facility is important for legal international commercial operation
World major ports invested heavily in developing their infrastructure during the last century. Legacy ports performance is based on modern port managers. Geographical location and physical design coupled with the professionals ability to manage change, adapt to change , and to anticipate the change in the industry

Port location is constrained by two physical characteristics of the site. The first involves land access and the second concerns maritime access. Both must be jointly satisfied . Historically, many ports emerged as safe harbors for fishing and those with convenient locations became trade hubs, many of which of free access and designed to protect trade. As such, Ports became nexus of urbanization with many becoming the first port cities playing an important role in the economic welfare of their regions. Today, many of the most important cities in the world owe their origin to their port location.

1.1 PORT TRAFFIC

Port traffic means the total amount of net tons, containers, or twenty-foot equivalent units (TEU's) of product imported into this state or exported out of this state by way of a waterborne ship or vehicle through a port facility. India has a coastline spanning 7516.6 kilometers, forming one of the biggest peninsulas in the world. According to the Ministry of Ports, Shipping and Waterways, around 95 per cent of India's trading by volume and 68 per cent by value is done through maritime transport. It is serviced by 13 major ports (12 Government-owned and one private) and 187 notified minor and intermediate ports. Port Blair which was notified as major port in 2010 was removed of its status recently.

The total 200 major and non-major ports are present in the following States: Maharashtra (53); Gujarat (40); Kerala (20); Tamil Nadu (15); Karnataka (10) and others (63). Government of India plans to modernize these ports and associated infrastructure through the 2015 established Sagarmala project,[2] and National Maritime Development Programme. Indian government has a federal structure, and according to its constitution, maritime transport is to be administered by both the Central and the State governments. While the central government's shipping ministry administers the major ports, the minor and intermediate ports are administered by the relevant departments or ministries in the nine coastal states of Andhra Pradesh, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu and West Bengal.

Several of these 187 minor and intermediate ports have been identified by the respective governments to be developed, in a phased manner, a good proportion of them involving public–private partnership. Major ports handled over 74% of all cargo traffic in 2007. All except Kamarajar Port Limited are government administered, but private sector participation in ports has increased.

There are also 7 shipyards under the control of the central government of India, 2 shipyards controlled by state governments, and 19 privately owned shipyards.
As of 2000, there were 102 shipping companies operating in India, of which five were privately owned and based in India and one was owned by Shipping Corporation of India. There were 639 government-owned ships, including 91 oil tankers, 79 dry cargo bulk carriers, and 10 cellular container vessels. The Indian-flagged vessels carried about 15 percent of overseas cargo at Indian ports for financial year 2003

1.2 OBJECTIVE OF THE STUDY

To study the port traffic to analyze the volume of goods and commodities being imported and exported

To study analyze trends, predict demand, and plan for future infrastructure developments.

To study the transportation planners can optimize routes, modes of transportation, and other logistics-related decisions.

To study the trade analysis.

To Suggest findings for the above study.

1.3 SCOPE OF THE STUDY

The Scope is limited to the ports operating in the maritime state , the indicators mention in IV chapter alone are considered for the study, the data is purely taken from the secondary sources of the "Basic Port Statistics" from the MOPSW. The primary data is not used for the study.

1.4 RESARCH METHODOLOGY

Literature review: Conduct a review of existing literature on the topic, including academic articles, books, and reports from reputable sources such as government agencies and international organizations.

Data collection: Collect data on the state wise port traffic over the past ten years.This data can be obtained from official government statistics or industry reports.

Data analysis: Analyse the data collected to identify the main port traffic areas around Indian ports

Conclusion: Draw conclusions from the research findings and make recommendations for the government.

1.5 LIMITATIONS OF THE STUDY

Any research study will be restricted in scope by certain inherent limitations that are part of the research. The study has following limitations:

Port traffic data can be incomplete, particularly for smaller ports or ports in developing countries.

Port traffic studies often focus on commercial traffic, but there may be other types of traffic (e.g., pleasure boats) that are not included in the analysis.

Lack of standardization of what constitutes port traffic, so researchers may be using different criteria to identify and classify traffic.

Inadequate sample sizes

CHAPTER II

LITERATURE REVIEW

Port Efficiency and International Trade: Port Efficiency as a Determinant of Maritime Transport Costs

The article "Port Efficiency and International Trade: Port Efficiency as a Determinant of Maritime Transport Costs" by Ricardo J Sánchez, Jan Hoffmann, Alejandro Micco, Georgina V Pizzolitto, Martin Sgut & Gordon Wilmsmeier explores the relationship between port efficiency and international trade. The authors examine the impact of port efficiency on maritime transport costs, and how this affects trade patterns.

The article provides a comprehensive review of the literature on port efficiency and its relationship with international trade. It also presents empirical evidence from various countries, which demonstrates the importance of port efficiency in reducing transport costs and increasing trade.

The authors argue that improving port efficiency is essential for reducing transport costs, and therefore increasing trade. They suggest that investments in port infrastructure and technology, as well as reforms to port management and operations, can lead to significant improvements in port efficiency.

Overall, the article provides valuable insights into the importance of port efficiency in international trade. It highlights the need for policymakers to prioritize investments in port infrastructure and technology, and to implement reforms to port management and operations in order to improve port efficiency. This will not only benefit the maritime transport sector, but also have wider economic benefits for countries seeking to increase their participation in international trade. (Sánchez et al., 2003)

Port traffic risks – A study of accidents in Hong Kong waters

"Port Traffic Risks - A Study of Accidents in Hong Kong Waters" by Tsz Leung Yip is a comprehensive and informative paper that investigates the risks associated with port traffic in

Hong Kong. The paper discusses historic accidents in Hong Kong port, which was once the world's busiest port, and highlights the alarming number of accidents that have occurred in the region. The paper reports that a total of 2012 marine accidents with 94 deaths were reported in Hong Kong waters in the years 2001-2005, while almost 40,000 oceanic ships and 200,000 coastal vessels arrive in the port every year.The paper provides valuable insights into the causes of these accidents, including human error, equipment failure, and environmental factors. It also discusses the measures that have been taken to mitigate these risks, such as the implementation of safety regulations and the use of advanced technology. (Yip, 2008)

Evaluation of the Marine Traffic Congestion of North Harbor in Busan Port

The study titled "Evaluation of the Marine Traffic Congestion of North Harbor in Busan Port" by Gi-Tae Yeo, Michael Roe, and Sang-Moon Soak provides a comprehensive analysis of the marine traffic congestion issue in Busan port, one of the busiest ports in the world. The authors conducted a detailed evaluation of the marine traffic congestion in North Harbor, which is the largest and busiest harbor in the port.

The study employed various methods to collect and analyze data, including a field survey, vessel traffic data analysis, and simulation modeling. The authors used a range of tools to evaluate the congestion, including the Average Time Distance (ATD) index, Vessel Traffic Service (VTS) data analysis, and simulation modeling using the A* algorithm. The results of the study revealed that the North Harbor of Busan port experiences severe congestion, particularly during peak hours.

The authors identified several factors contributing to the congestion, including increasing container traffic, delays in loading and unloading, insufficient handling capacity, and limitations in navigational infrastructure. The study also proposed a range of solutions to address the congestion issue, including the optimization of vessel traffic management, the improvement of navigation infrastructure, the development of advanced simulation tools, and the enhancement of the VTS system. (Yeo et al., 2007)

Port Performance: An Economics Perspective

Port Performance: An Economics Perspective" by Wayne K. Talley is a chapter that presents methodologies for evaluating the economic performance of a port. The chapter discusses the various factors that affect the performance of a port, such as technical efficiency, cost efficiency, and effectiveness. The author highlights the importance of evaluating the economic performance of a port to identify areas for improvement and to enhance the competitiveness of the port.The chapter provides valuable insights into the methods used to evaluate the economic performance of a port, such as data envelopment analysis (DEA) and stochastic frontier analysis (SFA). (Talley, 2006)

Port Efficiency and Trade Flows

"Port Efficiency and Trade Flows" by Bruce A. Blonigen and Wesley W. Wilson is a well-written and comprehensive analysis of the relationship between port efficiency and trade flows. The authors use a range of theoretical models and empirical analysis to explore how improvements in port efficiency can affect international trade patterns.

One of the strengths of the book is the way in which it synthesizes the existing literature on port efficiency and trade flows, providing a comprehensive overview of the key theories and empirical findings in this area. The authors also provide a detailed analysis of the factors that contribute to port efficiency, such as technological innovation, labor productivity, and regulatory frameworks.

The book's empirical analysis is also a significant strength. The authors use a range of econometric techniques to analyze data from a variety of sources, including trade statistics, port performance indicators, and survey data. The results of their analysis provide valuable insights into the relationship between port efficiency and trade flows, and highlight the importance of port efficiency in promoting international trade.

Another strength of the book is its policy relevance. The authors provide practical recommendations for policymakers on how to improve port efficiency, including investment in infrastructure, regulatory reform, and the adoption of new technologies. These recommendations are grounded in the theoretical and empirical analysis presented in the book, making them both evidence-based and actionable. (Blonigen & Wilson, 2008)

The impacts of port infrastructure and logistics performance on economic growth: the mediating role of seaborne trade

The impacts of port infrastructure and logistics performance on economic growth: the mediating role of seaborne trade" by Ziaul Haque Munim & Hans-Joachim Schramm is a scholarly article that examines the relationship between port infrastructure, logistics performance, seaborne trade, and economic growth. The study focuses on developing countries and aims to investigate how the mediating effect of seaborne trade impacts the relationship between port infrastructure and logistics performance on economic growth.

The authors use a quantitative approach and data from 81 developing countries from 2007 to 2015 to test their hypothesis. The study finds that port infrastructure and logistics performance have a significant positive impact on economic growth, and seaborne trade mediates this relationship. The study suggests that seaborne trade plays a crucial role in the development of a country's economy by providing access to international markets and promoting foreign investment.

Overall, the article provides valuable insights into the importance of seaborne trade in the economic growth of developing countries. The authors' use of quantitative methods and data from multiple countries makes the findings more robust and generalization. The article's contribution to the literature is significant, as it sheds light on the mediating effect of seaborne trade, which has not been explored in previous studies. The study also highlights the importance of investing in port infrastructure and improving logistics performance to enhance a country's economic growth.

One limitation of the study is that it only focuses on developing countries and does not examine the relationship between port infrastructure, logistics performance, and economic growth in developed countries. Furthermore, the authors did not consider the impact of other factors such as political stability, corruption, and trade policies, which could also influence a country's economic growth. (Munim & Schramm, 2018)

Review on the Role of Ports in the Development of a Nation

"Review on the Role of Ports in the Development of a Nation" by G.S. Dwarakish and Akhil Muhammad Salim is a paper that provides an overview of the role played by ports in the development of a nation. The paper reviews studies conducted on the significance of ports and economic reports from various countries.The authors highlight the importance of ports in promoting economic growth, regional balanced development, and national integration to the

world economic market. The paper discusses the various factors that affect the role of ports in the development of a nation, such as hinterland connectivity, human resources, industry, land transportation, markets, raw materials, trade, and water transportation. (Dwarakish & Salim, 2015)

Efficiency Measurement in the Port Industry: A Survey of the Empirical Evidence

Efficiency Measurement in the Port Industry: A Survey of the Empirical Evidence by González and Trujillo is a comprehensive study that sheds light on the efficiency and productivity of the port sector. The authors have done an excellent job of analyzing the empirical evidence and presenting it in a clear and concise manner. The study highlights the importance of efficiency in the port industry and how it can be measured using various methods.The study is particularly useful for port managers and policymakers who are looking to improve the efficiency of their ports. The authors have identified several factors that contribute to port efficiency, including technological innovation, logistic infrastructure, on-time shipment, up-to-date delivery, and competitive prices. The study also provides insights into the users' perspective on port performance, which is a relatively new area of research. (*(PDF) Efficiency Measurement in the Port Industry: A Survey of the Empirical Evidence*, n.d.)

An analysis of port congestion alleviation strategy based on system dynamics

The paper "An analysis of port congestion alleviation strategy based on system dynamics" by Haonan Lin, Weijun Zeng, Jian Luo, and Guofang Nan is a well-researched and informative study on the impacts of different strategies on port congestion. The authors construct a dynamic model based on system dynamics to discuss the impacts of different strategies on port congestion. The study investigates the performance of the epidemic prevention alliance strategy (EPAS), shared berths strategy (SBS), and their hybrid strategy in alleviating port congestion. The results indicate that the key issue of port congestion stems from the implementation of epidemic preventive measures. Among these three strategies, the hybrid strategy performs the best in alleviating the port congestion, improving integrated service levels, and curbing the fluctuation of container price. The study is relevant and timely, especially during the COVID-19 epidemic, where port congestion has become a key factor restricting international trade and economic development. The authors provide a comprehensive analysis of the factors affecting port

congestion, including the integrated service level of liner routes, empty container allocation, port congestion, and regional economics. The study's findings can be useful for policymakers, port operators, and other stakeholders in the maritime industry to develop effective strategies to alleviate port congestion (Lin et al., 2022)

Port performance factors and their interactions: A systems thinking approach

The paper "Port performance factors and their interactions: A systems thinking approach" by Yos Sunitiyoso, Shimaditya Nuraeni, Noorhan Firdaus Pambudi, Tutik Inayati, Ilham Fadhil Nurdayat, Fikri Hadiansyah, and Adhya Rare Tiara is a comprehensive study that explores the factors affecting port performance and their interactions. The authors use a systems thinking approach to analyze the complex relationships between different factors that affect port performance, including infrastructure, technology, human resources, regulations, and environmental factors. The study provides a detailed analysis of the interactions between these factors and their impact on port performance. The authors also discuss the challenges faced by ports in improving their performance and suggest strategies to overcome these challenges. The study is relevant and timely, given the increasing importance of ports in global trade and the need for ports to improve their performance to remain competitive. The authors provide valuable insights into the factors affecting port performance and their interactions, which can be useful for policymakers, port operators, and other stakeholders in the maritime industry (Sunitiyoso et al., 2022)

Assessment of port efficiency within Latin America

The article "Assessment of port efficiency within Latin America" by Kahuina Miller and Tetsuro Hyodo is a well-researched and informative contribution to the literature on port efficiency in Latin America. The authors use Stochastic Frontier Analysis (SFA) to determine the technical efficiency (TE) of 19 ports in the Latin America and Caribbean (LAC) region from 2010 to 2018. The study finds that the TE results vary significantly among the ports, with Port of Colon and Balboa in Central America achieving 100% TE, while Altamira in Mexico only achieving 55.1% TE. The authors also identify influential factors that affect port efficiency, such as infrastructure, technology, and government policies.The article provides valuable insights into the performance of ports in the LAC region and highlights the importance of examining port efficiency to capitalize on economic opportunities through seaborne trade. The study's findings

can be useful for policymakers, port operators, and investors in identifying areas for improvement and enhancing the competitiveness of the region's ports. However, the study's limitations include the use of data from a limited time period and the focus on technical efficiency rather than other aspects of port performance, such as environmental sustainability and social responsibility. Nonetheless, the article is a valuable resource for anyone interested in the efficiency of ports in Latin America. (Miller & Hyodo, 2022)

Ports' criticality in international trade and global supply-chains

The article "Ports' criticality in international trade and global supply-chains" by J. Verschuur, E. E. Koks, and J. W. Hall provides a comprehensive analysis of the importance of ports in global supply chains. The authors quantify the criticality of the world's 1300 most important ports for global supply chains by predicting the allocation of trade flows on the global maritime transport network and linking it to a global supply-chain database to evaluate the importance of ports for the economy. The study finds that 50% of global trade in value terms is maritime, with low-income countries and small islands being 1.5 and 2.0 times more reliant on their ports compared to the global average. The five largest ports globally handle goods that embody >1.4% of global output, while 40 ports add >10% of domestic output.The article highlights the critical role of ports in international trade and global supply chains. The study's findings can be useful for policymakers, port operators, and investors in identifying the most important ports and enhancing their competitiveness. The article also emphasizes the need for investments in port infrastructure, technology, and logistics processes to improve the efficiency and resilience of global supply chains. The study's identification of critical cross-border infrastructure dependencies for some landlocked and island countries that rely on specific ports outside their jurisdiction is particularly noteworthy (Verschuur et al., 2022)

Smart ports: towards a high performance, increased productivity, and a better environment

The article "Smart ports: towards a high performance, increased productivity, and a better environment" by Hayder Ali Al-Fatlawi and Hassan Jassim Motlak discusses the concept of smart ports and their potential benefits. The authors argue that smart ports, which integrate information and communication technologies within smart applications, can improve port performance, increase productivity, and contribute to a better environment. The article highlights the

automation of all operations performed by the port and the communication of all port activities through the auto transmission of mobile data in real-time as key features of smart ports. The authors also emphasize the need to consider critical factors such as greenhouse gas emissions when automating port operations. The article provides a useful overview of the concept of smart ports and their potential benefits. However, the article could benefit from more specific examples of smart port technologies and their implementation in real-world scenarios. (Al-Fatlawi & Motlak, 2023)

Revisiting traffic forecasting by port authorities in the context of port planning and Development

Revisiting traffic forecasting by port authorities in the context of port planning and development" is a research paper authored by Francesco Parola, Giovanni Satta, Theo Notteboom, and Luca Persico. The paper aims to provide insights into the forecasting methods used by port authorities to estimate the future demand for port services and the implications of these forecasts for port planning and development.

The authors first examine the various factors that influence port traffic and highlight the complexity of predicting future demand. They then review the different forecasting methods used by port authorities, such as trend analysis, econometric modeling, and scenario analysis, and evaluate their strengths and weaknesses.

One of the main contributions of the paper is the critical examination of the assumptions and limitations underlying forecasting models. The authors argue that forecasting accuracy can be improved by incorporating a more extensive range of factors, such as technological change, trade policies, and climate change. They also discuss the importance of scenario analysis, which allows for the exploration of different future scenarios, each with different assumptions and uncertainties.

The paper concludes with recommendations for port authorities on how to improve their forecasting practices, including adopting a more comprehensive and dynamic approach to forecasting, using multiple methods and scenarios, and regularly updating forecasts in response to changing circumstances. (Parola et al., 2021)

The Impact of Port Performance on Trade

"The Impact of Port Performance on Trade: The Case of Selected African States" is a research paper written by Courage Mlambo. The paper aims to examine the impact of port performance on trade in selected African states, with a focus on the factors that influence port performance and their implications for trade.

The author begins by providing a brief overview of the importance of ports in facilitating international trade and economic growth. He then identifies key factors that affect port performance, such as infrastructure, technology, management, and regulatory environment, and reviews the literature on the relationship between port performance and trade.

The main contribution of the paper is the empirical analysis of the relationship between port performance and trade in five African countries: South Africa, Egypt, Ghana, Nigeria, and Kenya. The author uses a panel data analysis approach to investigate the impact of port performance indicators, such as vessel turnaround time, berth occupancy rate, and cargo dwell time, on trade performance indicators, such as trade volume, trade value, and trade balance.

The results of the analysis indicate that there is a positive and significant relationship between port performance and trade in all five countries. The author also finds that infrastructure, technology, and management are the most critical factors affecting port performance, while the regulatory environment has a relatively minor impact (Mlambo, 2021)

Port efficiency, maritime transport costs, and bilateral trade

"Port efficiency, maritime transport costs, and bilateral trade" is a research paper co-authored by Ximena Clark, David Dollar, and Alejandro Micco. The paper examines the relationship between port efficiency, maritime transport costs, and bilateral trade.

The authors first provide an overview of the importance of ports in facilitating international trade and economic growth. They then present a theoretical framework that highlights the role of port efficiency and maritime transport costs in shaping trade flows and bilateral trade relationships.

Using a gravity model approach and a panel data set of 125 countries for the period 1990-2000, the authors empirically investigate the impact of port efficiency and maritime transport costs on bilateral trade. They also examine the interaction between these factors and other determinants of trade, such as distance, income, and trade policy.

The results of the analysis suggest that port efficiency and maritime transport costs have a significant impact on bilateral trade. Specifically, the authors find that higher port efficiency leads

to increased trade, while higher maritime transport costs reduce trade. They also find that the effect of port efficiency is more significant for developing countries, while the effect of transport costs is more significant for developed countries. (Clark et al., 2004)

The Port Network as a New Stage in Port Development

"The Port Network as a New Stage in Port Development: The Case of Rotterdam" is a research paper written by H.A. van Klink. The paper examines the development of Rotterdam port as a network of interdependent ports, terminals, and logistics centers, and explores the implications of this development for port management and governance.

The author first provides an overview of the historical development of Rotterdam port, highlighting the various stages of port development, from traditional port operations to the emergence of a logistics hub. He then introduces the concept of the port network and explains how it represents a new stage in port development, characterized by increased connectivity, interdependence, and competition.

Using the case of Rotterdam port, the author illustrates how the port network has emerged as a result of various factors, such as technological innovation, globalization, and changing market demands. He also examines the implications of this development for port management and governance, highlighting the need for a more collaborative and flexible approach to port management. (Van Klink, 1998)

Port Efficiency and International Trade in China

"Port Efficiency and International Trade in China" is a research paper written by Young-Tae Chang, Ahhyun Jo, Kyoung-Suk Choi, and Suhyung Lee. The paper investigates the impact of port efficiency on international trade in China.

The authors begin by providing an overview of the importance of ports in facilitating international trade and economic development. They then present a theoretical framework that highlights the role of port efficiency in reducing transaction costs and improving trade performance.

Using a gravity model approach and panel data for 24 Chinese provinces over the period 2001-2012, the authors empirically examine the impact of port efficiency on trade. They also investigate the interaction between port efficiency and other determinants of trade, such as distance, income, and trade policy.

The results of the analysis suggest that port efficiency has a significant positive impact on international trade in China. Specifically, the authors find that a one-unit increase in port efficiency leads to a 3.4% increase in exports and a 2.8% increase in imports. They also find that the effect of port efficiency is more significant for regions with high trade volumes and for regions that are more integrated into global value chains. (Chang et al., 2020)

Development of a system of indicators for sustainable port management

"Development of a system of indicators for sustainable port management" is a research paper written by Peris-Mora, J.M. Diez Orejas, A. Subirats, S. Ibáñez, and P. Alvarez. The paper focuses on the development of a system of indicators for sustainable port management that can be used to monitor and evaluate the environmental, social, and economic performance of ports.

The authors begin by providing an overview of the importance of sustainability in port management and the need for a comprehensive and integrated approach to sustainable port management. They then describe the methodology used to develop the system of indicators, which includes a literature review, stakeholder engagement, and expert consultation. The paper presents a set of 40 indicators, organized into six categories: environmental, economic, social, institutional, operational, and health and safety. The indicators are designed to be comprehensive and cover a wide range of sustainability issues, such as air and water quality, energy efficiency, social responsibility, and stakeholder engagement.

The authors demonstrate the usefulness of the system of indicators by applying it to the case of the Port of Valencia in Spain. They show how the indicators can be used to identify areas of strength and weakness in the port's sustainability performance and to inform decision-making and policy development. (Paris-Mora et al., 2005)

Economic Impact of a Port on a Regional Economy

"Economic Impact of a Port on a Regional Economy" is a research paper written by Gilbert R. Yochum and Vinod B. Agarwal. The paper focuses on the economic impact of a port on a regional economy and presents a case study of the Port of Los Angeles in California.

The authors begin by providing an overview of the importance of ports in regional economies and the factors that influence the economic impact of a port, such as location, infrastructure, and trade policies. They then describe the methodology used to estimate the economic impact of the Port of Los Angeles, which includes an input-output analysis and a multiplier analysis.

The paper presents the results of the analysis, which show that the Port of Los Angeles has a significant economic impact on the regional economy. Specifically, the authors find that the port generates $11.8 billion in economic output, supports 101,000 jobs, and generates $4.1 billion in personal income.

The authors also discuss the limitations of the study, such as the reliance on secondary data and the assumptions made in the analysis. They offer suggestions for future research, such as the use of primary data and the inclusion of non-market values in the analysis. (YOCHUM & AGARWAL, 1987)

Port Development: From Gateways to Logistics Hub

"Port Development: From Gateways to Logistics Hubs" is a research paper written by S.J. Pettit and A.K.C. Beresford. The paper explores the evolution of ports from traditional gateways to logistics hubs, and the challenges and opportunities that arise from this transformation.

The authors begin by providing an overview of the historical development of ports as gateways for goods and passengers. They then describe the recent trend towards the development of ports as logistics hubs, which involves a shift from traditional cargo handling to value-added logistics services such as warehousing, distribution, and transportation.

The paper presents a conceptual framework for understanding the development of ports as logistics hubs, which includes four key elements: physical infrastructure, operational capabilities, service networks, and governance structures. The authors discuss each of these elements in detail and provide examples of successful port logistics hubs, such as the Port of Rotterdam and the Port of Singapore.

The authors also discuss the challenges and opportunities that arise from the development of ports as logistics hubs. These include the need for investment in physical infrastructure, the development of new skills and capabilities in the workforce, the integration of information technology, and the need for collaboration and coordination between different stakeholders. (Pettit & Beresford, 2009)

CHAPTER 3

INDUSTRY PROFILE & PORT PROFILE

3.1 INDUSTRY PROFILE

Ports are facilities that provide a secure and convenient site for ships to dock and load or unload cargo. Ports are situated on the coast or shore of a body of water, such as a sea, river, or lake. Ports, which can be either natural or artificial, are crucial for both international trade and transportation. To support the transportation of goods and people, ports often have a wide range of facilities and services, such as cargo terminals, container yards, warehouses, cranes, tugboats, pilots, stevedores, customs officials, immigration officers, and security staff. A port's size, location, and area of specialization all affect the unique facilities and services that are offered there.

Port authorities or government organizations are normally in charge of managing ports. They are in charge of directing and coordinating port operations, maintaining port infrastructure, and guaranteeing safety and security. Various users, such as shipping companies, cargo owners, port service providers, and recreational boaters, may also frequent ports

The International Maritime Organization's (IMO) International Ship and Port Facility Security (ISPS) Code, which defines measures to improve the security of ships and port facilities, is one of a number of international laws and standards that control operations at ports. The International Convention on Standards of Training, Certification, and Watch keeping for Seafarers (STCW), which establishes minimum training and certification requirements for seafarers, and the International Convention for the Safety of Life at Sea (SOLAS), which establishes standards for the safety of ships and their crews, are additional regulations.

Ports are important hubs for international trade and transportation because they offer the facilities and services needed for ships to load and unload cargo in a secure and timely manner. To maintain

safety, security, and environmental preservation, port activities are supervised by international standards and regulations.

3.1.1 PORT ADMINISTRATION MODEL

- Public Service Port

The public Port Authority offers all the services required for the functioning of the seaport system.Service ports have a predominantly public character. The number of service ports is declining. Many former service ports are in transition toward a landlord port structure, such as Colombo (Sri Lanka), Nhava Sheva (India), and Dar es Salaam (Tanzania). However some ports in developing countries are still managed according to the service model. Under it, the port authority offers the complete range of services required for the functioning of the seaport system. The port owns, maintains, and operates every available asset (fixed and mobile), and cargo handling activities are executed by labor employed directly by the port authority. Service ports are usually controlled by (or even part of) the ministry of transport (or communications) and the chairman (or director general) is a civil servant appointed by, or directly reporting to, the minister concerned.Under a tool port model, the port authority makes land and superstructures available to cargo handling companies.

- Tool Port

The Port Authority manages the port infrastructure and heavy superstructure, with private cargo-handling companies providing commercial services. In the tool port model, the port authority owns,develops, and maintains the port infrastructure as well as the superstructure, including cargo handling equipment such as quay cranes and forklift trucks. Port authority staff usually operates all equipment owned by the port authority. Other cargo handling on board vessels as well as on the apron and on the quay is usually carried out by private cargo handling firms contracted by the shipping agents or other principals licensed by the port authority.

The Port of Chittagong (Bangladesh) is a typical example of the tool port. The Ports Autonomous in France are also examples, in particular the container terminals, which are managed and operated along the principles of the tool port, although for more recent terminals the private terminal

operators have made the investment in gantry cranes. This arrangement has generated conflicts between port authority staff and terminal operators, which has impeded operational efficiency.
a tool port does have its advantages, particularly when it is used as a means of transition to a landlord port. Using the tool port model as a catalyst for transition can be an attractive option in cases where the confidence of the private sector is not fully established and the investment risk is considered high. A tool port may mitigate this by reducing initial capital investment requirements.

- Landlord Port

The Port Authority acts as a regulatory body and as a landlord. Port operations are carried out by private companies. the landlord port is characterized by its mixed public-private orientation. Under this model, the port authority acts as regulatory body and as landlord, while port operations (especially cargo handling) are carried out by private companies. Examples of landlord ports are Rotterdam, Antwerp, New York, and since 1997, Singapore. Today, the landlord port is the dominant port model in larger and medium-sized ports. In the landlord port model, infrastructure is leased to private operating companies or to industries such as refineries, tank terminals, and chemical plants.

- Fully Privatized or Private Service Port

The port is privately owned, operated and sometimes self-regulated.Fully privatized ports (which often take the form of a private service port) are few in number, and can be found mainly in the United Kingdom (U.K.) and New Zealand. Full privatization is considered by many as an extreme form of port reform. It suggests that the state no longer has any meaningful involvement or public policy interest in the port sector. In fully privatized ports, port land is privately owned, unlike the situation in other port management models. This requires the transfer of ownership of such land from the public to the private sector. In addition, along with the sale of port land to private interests, some governments may simultaneously transfer the regulatory functions to private successor companies. In the absence of a port regulator in the U.K., for example, privatized ports are essentially self-regulating.

The risk in this type of arrangement is that port land can be sold or resold for nonport activities, thereby making it impossible to reclaim for its original maritime use. Moreover, there is also the

possibility of land speculation, especially when port land is in or near a major city. Furthermore, sale of land to private ports may also sometimes raise a national security issue.

- Corporatized Port: The process of corporatization means that there is a change in legal structure. Its should not be confused with privatization or disinvestment. The ownership prior to and after the corporatization remains with the Government. Thus, no major impact can be expected by mere change in the legal structure.

3.1.2 INDIAN PORTS HISTORY

India has a long and rich history of ports dating back thousands of years. The country's strategic location on the Indian Ocean, as well as its extensive coastline, has made it a crucial hub for international trade and commerce for centuries. Here's a brief overview of the history of Indian ports:

Indus Valley Civilization (2600-1900 BCE): The Indus Valley Civilization, one of the world's earliest civilizations, was located in present-day Pakistan and northwest India. It had several ports along the Indus River and its tributaries, including Lothal, which was a major center of trade and commerce.

Mauryan Empire (321-185 BCE): The Mauryan Empire was one of the largest empires in ancient India. During this period, the port of Pataliputra (present-day Patna) on the Ganges River became a major center of trade and commerce.

Gupta Empire (320-550 CE): The Gupta Empire was a golden age of Indian civilization, known for its advances in science, art, and literature. During this period, the ports of Tamralipta (present-day Tamluk) and Kalyan (present-day Mumbai) became important centers of maritime trade.

Chola Dynasty (850-1250 CE): The Chola Dynasty was a powerful empire in southern India that controlled a vast network of ports along the Coromandel Coast, including Kaveripattinam (present-day Poompuhar), Nagapattinam, and Kollam.

Mughal Empire (1526-1857): The Mughal Empire was one of the largest and most powerful empires in Indian history. During this period, the port of Surat became a major center of trade and commerce, attracting merchants from all over the world.

British Raj (1858-1947): The British East India Company established several ports along India's coastline, including Mumbai, Chennai, Kolkata, and Kochi. These ports became key centers of trade and commerce under British rule and played a crucial role in India's economy.

3.1.3 TYPES OF PORT

There are several types of ports, each designed to serve a specific purpose. Here are some of the most common types of ports:

- Seaports

Seaports are ports located on the coast or on a navigable river that provide facilities for the loading and unloading of cargo from ships. They are the most common type of port and handle a wide range of cargo, including containers, bulk cargo, and petroleum products.

- Inland ports

Inland ports are ports located on a river, lake, or canal that provide facilities for the loading and unloading of cargo from barges and other inland vessels. They are typically located in the interior of a country, far away from the coast.

- Fishing ports

Fishing ports are ports that provide facilities for the landing and processing of fish and other seafood. They typically have facilities for storing, freezing, and transporting seafood to markets and processing plants.

- Cruise ports

Cruise ports are ports that provide facilities for cruise ships to dock and passengers to disembark. They typically have facilities for customs and immigration processing, baggage handling, and passenger amenities such as restaurants, shops, and entertainment.

- Military ports

Military ports are ports that are used by the military for the loading and unloading of military equipment and supplies. They typically have security measures in place to restrict access and protect military assets

- Container ports

Container ports are ports that specialize in handling containerized cargo. They typically have facilities for the loading and unloading of containers from ships, as well as for the storage and transportation of containers on trucks and trains.

- Dry ports

Dry ports are inland terminals that provide facilities for the loading and unloading of containers from trucks and trains. They are typically located near major transportation hubs and are used to facilitate the movement of cargo between seaports and inland destinations.

3.1.4 PORT TRAFFIC

Port traffic refers to the movement of goods and people through ports, which are key nodes in global trade networks. Port traffic includes the volume of cargo handled by a port, the number of ships that call at the port, and the number of passengers that pass through the port. There are several factors that influence port traffic. One of the most important factors is the port's location. Ports that are situated along major shipping routes or in close proximity to major markets tend to have higher traffic volumes. For example, the Port of Shanghai in China is located on the Yangtze River Delta, which is the most developed region in China, and is well-connected to the country's

extensive road and rail networks. As a result, it is one of the busiest ports in the world, handling over 40 million TEUs (twenty-foot equivalent units) of cargo in 2020.

Another important factor that affects port traffic is the types of goods that are handled at the port. Ports that specialize in certain types of cargo, such as bulk commodities like coal, iron ore, or grain, tend to have more stable traffic volumes than ports that handle a variety of cargo types. For example, the Port of Rotterdam in the Netherlands is the largest port in Europe and is a major hub for the trade in crude oil, petroleum products, and natural gas. Its traffic volumes are largely determined by global demand for these commodities.

The efficiency of port operations also plays a significant role in determining port traffic. Ports that have modern, well-maintained infrastructure and advanced logistics and management systems can handle cargo more quickly and efficiently, which attracts more traffic. Additionally, ports that offer value-added services, such as warehousing, distribution, and customs clearance, can increase their attractiveness to shippers and consignees.

Finally, regulatory factors can also impact port traffic. Government policies and regulations, such as tariffs, trade agreements, and environmental regulations, can affect the volume and types of cargo that are handled at a port. For example, the United States' imposition of tariffs on Chinese goods in 2018 led to a decline in the volume of cargo handled by Chinese ports, as many shippers rerouted their cargo through other ports in the region.

Port traffic is a key indicator of a port's performance and its importance within the global supply chain. It refers to the volume of cargo and number of vessels and passengers that pass through a port. The volume of cargo is typically measured in TEUs (twenty-foot equivalent units), which is the standard measurement for containerized cargo.

The factors that influence port traffic can be broadly divided into two categories: demand-side factors and supply-side factors. Demand-side factors are those that are driven by the demand for goods and services that are transported through the port. These include:

Location: Ports that are located in strategic positions, such as along major shipping lanes or close to large markets, tend to have higher traffic volumes. For example, the Port of Singapore is situated at the crossroads of major shipping lanes between Asia, Europe, and the Americas, and

serves as a key transshipment hub. This strategic location has helped it become the world's busiest transshipment port.

Economic conditions: The level of economic activity, both domestically and globally, affects the demand for goods and services that are transported through the port. When economic conditions are favorable, demand for goods tends to increase, which in turn leads to higher port traffic. Conversely, when economic conditions are poor, demand for goods may decline, leading to lower port traffic.

Types of cargo: The types of goods that are transported through the port can also affect port traffic. Some ports specialize in certain types of cargo, such as bulk commodities like coal or grain, while others handle a wide variety of goods. Ports that specialize in a particular type of cargo may have more stable traffic volumes than those that handle a wider range of goods.

Trade policies: Government policies and regulations, such as tariffs and trade agreements, can affect the volume and types of cargo that are transported through the port. Changes in trade policies can lead to shifts in trade flows, which can in turn affect port traffic.

On the other hand, supply-side factors are those that are driven by the capacity and efficiency of the port itself. These include:

Infrastructure: The quality and capacity of port infrastructure, such as docks, berths, and cranes, can affect the port's ability to handle cargo efficiently. Ports that have modern and well-maintained infrastructure are more likely to attract traffic than those with outdated or insufficient infrastructure.

Services: The availability of value-added services, such as warehousing, distribution, and customs clearance, can make the port more attractive to shippers and consignees. Ports that offer these services can differentiate themselves from other ports and increase their competitiveness.

Operational efficiency: The efficiency of port operations, such as cargo handling and vessel turnaround times, can affect the port's ability to handle cargo quickly and reliably. Ports that are able to handle cargo efficiently are more likely to attract traffic than those that are not.

Environmental factors: Environmental regulations and concerns can also affect port traffic. Ports that have implemented measures to reduce their environmental impact, such as by reducing emissions or implementing sustainable practices, may be viewed more favorably by shippers and consignees who are increasingly concerned about sustainability.

3.1.5 IMPORTS FROM INDIA

India has seen a steady increase in imports over the last few years thanks to reliable and pertinent import data. The quantity of goods imported into India has expanded dramatically, and as a result, so has the size of the trade market. Mineral fuels, including oil, gems, precious metals, electrical equipment, machinery, including computers, and organic chemicals are among India's biggest imports. India is primarily responsible for importing particular items from a number of developing nations for export to other overseas markets. Additionally, the top data import export service has the most accurate import export data available. We'll talk about the top imports into India in this blog.

India's import sector is significant and more lucrative than its export sector. Many different goods or products are imported into India. It also has a significant impact on how the economy of the country develops. 52.01 billion USD were imported into India last year, up 23.74% from 42.03 billion USD in January 2021. India imported 495.83 billion USD worth of goods in 2021–22.
The countries to which India imports are

- China
- United States
- United Arab Emirates
- Saudi Arabia
- Iraq
- Switzerland
- Hong Kong
- South Korea
- Indonesia
- Singapore

High Demand Products for Imports in India

In the crisis of Covid-19, the Prime Minister Narendra Modi has announced the new initiative called Atma Nirbhar Bharat, the main objective of this initiative to be self-dependent. But there are some products or commodities that the economy has to rely on.

- Electronics:

Over the last ten years, the use of electronic gadgets has become more widespread over the world, and Indians have followed this trend as well. Also every year, India imports electronics worth billions of dollars. the majority of these goods originate in China. India does produce and export a small number of its own electronic goods, but they still have a long way to go before they import as much as they export.

- Heavy Machinery:

Heavy machinery equipment is yet another significant import for India. Construction and industrialization use these huge instruments. The majority of heavy equipment is being imported from China and Japan. According to Data Import Export, currently, the value of this import sector is at $20 billion.

- Transport equipment:

For economic development, efficient means of transport are quite significant. Motor vehicles, ships, airplanes etc. are imported from abroad. These are imported from the USA, Britain, Germany, Italy and Japan etc.

- Petrol and Petroleum products:

As we know, India is largely dependent on petrol and petroleum products. India imports 35% of its petroleum products from foreign. Also, Petroleum comes from Iran, Kuwait, Iraq and Saudi Arabia.

- Chemical fertilizers:

To increase the productivity of land fertilizers, chemical fertilizers are very useful. Also, India imports large quantities of chemical fertilizers from various countries. According to India Import data, India imports large quantity of chemical fertilizers from U.S.A., Russia and E.U

- Food grains:

India's top import products are food grains. It also plays a significant role in growing the economy. Last few years back, India faced acute shortage of food grains., food grains were imported from America, Australia, Canada, Burma and Argentina.

- Iron and Steel:

As we know, India is still dependent on the production of iron and steel. Also it imports steel every year. According to the import data, it is imported from the USA, UK, Italy and France to fulfil the economic requirements.

3.1.6 EXPORTS FROM INDIA

In recent decades, India has emerged as a significant exporter, which has helped the Indian economy soar to new heights. The quantity of goods exported from India has increased dramatically, and the market is currently more expansive than ever. India is largely responsible for importing specific items into several overseas markets. The major exports from India include sugarcane, automobiles, jewellery, pharmaceuticals, and petroleum products.

India's export volume increased by a record amount in the first seven months of 2021–2022. India sold items worth more than $197 billion between April and September 2021, with monthly exports exceeding $30 billion. As a result, India's export industry is profitably advantageous.
The top exporting countries from India are

- USA
- China
- UAE
- Hong Kong
- Bangladesh

High Demand Products for Export From India

- Petroleum Products

Jet fuel, liquid petroleum gas, petrol, diesel, lubricants and other petroleum products are among the exports of India. Among the top five exporters of refined petroleum goods, India primarily serves the markets of the United Arab Emirates, China, the United States, Singapore, and the Netherlands. After China, India is Asia's largest exporter and refiner.

- Jewellery

Around 20% of the gold produced worldwide is consumed by India, and 75% of that gold is used to make jewellery. In order to prevent a sharp decline in the business, banks and government initiatives support the jewellery sector. Only the United States imports almost 30% of the jewelery produced in India. Hong Kong, the United Arab Emirates, Singapore, and Belgium are further examples.

- Drugs And Pharmaceuticals

India is a major producer and exporter of pharmaceuticals, including generic drugs and medicines. In terms of volume, the nation has the third-largest pharmaceutical market. Nearly 20% of the genetic medication exports worldwide and 40% of the genetic formulations used in the United States of America come from Indian products. India is also the biggest vaccine

- Textiles

Textiles: India is known for its textile industry and exports a variety of fabrics, garments, and accessories, including cotton, silk, and wool. India is regarded as the second-largest cotton producer in the world and exports 23% of the cotton produced globally. Additionally, it contains a sizable area where cotton is grown. Cotton is the main industry in exile in India,

- Electronics

India is still regarded as an importer of electronic equipment even if it produces some of it.
The export component of this industry, however, is what really thrives.

The local need for electronic goods causes the industry to expand faster and stronger, making expo rt all the more crucial. India boasts the third-largest pool of electronic scientists and engineers.

3.2 PORT PROFILE

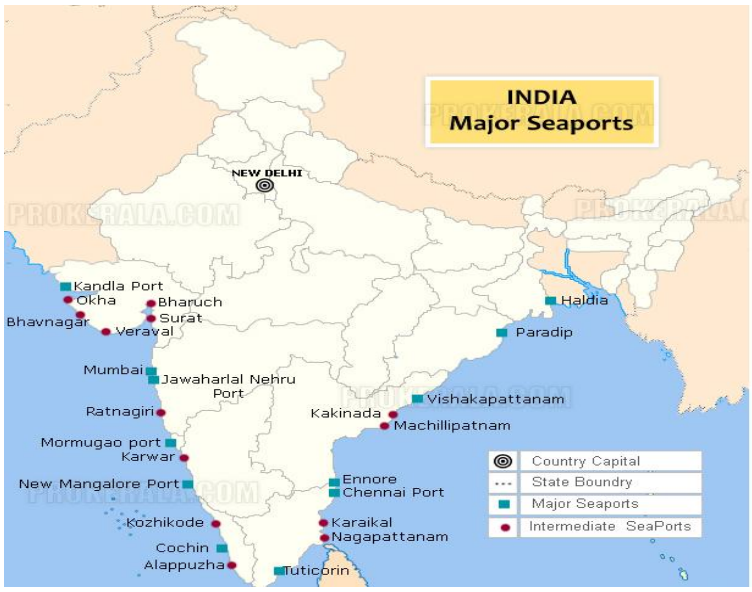

Fig 3.1 Major Seaports of India

India is a country with a long coastline, and it has a number of major ports situated along its coastline. These ports play a vital role in India's economy as they serve as gateways for India's international trade. India has a total of 13 major ports, which are controlled by the Central Government's Ministry of Shipping. In this answer, we will provide a detailed explanation about these major ports in India.

Mumbai Port: Mumbai Port is the largest port in India and handles around 60% of India's total maritime trade. It is located in Mumbai, Maharashtra, and has a natural deep-water harbor. The port handles a wide range of cargo, including container, liquid, and dry bulk cargo.

Jawaharlal Nehru Port: Jawaharlal Nehru Port is situated in Navi Mumbai, Maharashtra. It is the largest container port in India and the fifth-largest in the world. The port is well-connected to major highways and railways, making it an important hub for containerized cargo.

Kandla Port: Kandla Port is located in the Kutch district of Gujarat and is one of India's major ports. It handles a wide range of cargo, including liquid, dry bulk, and container cargo. The port is strategically located, making it an important gateway for trade with the Middle East.

Chennai Port: Chennai Port is located in Chennai, Tamil Nadu, and is the second-largest port in India. It handles a wide range of cargo, including container, liquid, and dry bulk cargo. The port is well-connected to major highways and railways, making it an important hub for trade in southern India.

Visakhapatnam Port: Visakhapatnam Port is situated in Andhra Pradesh and is one of India's major ports. It handles a wide range of cargo, including iron ore, coal, and container cargo. The port is well-connected to major highways and railways, making it an important hub for trade in eastern India.

Paradip Port: Paradip Port is located in Odisha and is an important port for handling iron ore, coal, and crude oil. The port is well-connected to major highways and railways, making it an important hub for trade in eastern India.

Ennore Port: Ennore Port is located in Chennai, Tamil Nadu, and is a major port for handling coal and iron ore. The port is well-connected to major highways and railways, making it an important hub for trade in southern India.

Cochin Port: Cochin Port is located in Kochi, Kerala, and is an important port for handling container, liquid, and dry bulk cargo. The port is well-connected to major highways and railways, making it an important hub for trade in southern India.

New Mangalore Port: New Mangalore Port is located in Karnataka and is an important port for handling petroleum, fertilizers, and container cargo. The port is well-connected to major highways and railways, making it an important hub for trade in western India.

Mormugao Port: Mormugao Port is located in Goa and is an important port for handling iron ore, coal, and general cargo. The port is well-connected to major highways and railways, making it an important hub for trade in western India.

Tuticorin Port: Tuticorin Port is located in Tamil Nadu and is an important port for handling container, liquid, and dry bulk cargo. The port is well-connected to major highways and railways, making it an important hub for trade in southern India.

Haldia Port: Haldia Port is located in West Bengal and is an important port for handling dry bulk and container cargo. The port is well-connected to major highways and railways, making it an

PORT PERFORMANCE INDICATORS

- Turn Round Time (TRT)

- Ships Turn Round Time (TRT) in the port is the primary indicator to judge the quality of service being given by the port to the ships. TRT is the total time spent by a vessel at the port from its arrival at reporting station till its departure from the reporting station. It thus includes pre berthing waiting time, navigation time (inward movement and outward movement time), stay at working and non-working berth sand shifting time". However, the detention/idle time due to litigation, fire, repair/dry docking, delay in the decision regarding dismantling, etc. are not to be included in their TRT. The Turn Round Time shall comprise the following components only:
- (i) Pre- Berthing Waiting Time
- (ii) Inward Movement Time
- (iii) Stay at Working /Non-working Berths
- (iv) Shifting Time
- (v) Outward Movement Time

- Pre- Berthing Waiting Time(PBWT)

This is the amount of time it takes for a ship to travel from the time it anchors and notifies the reporting station until it reaches the operational berth, omitting the time needed for inward movement. By dividing the total pre-berthing waiting time of all cargo vessels summoned to the port during a period by the number of cargo vessels that sailed during that period, the average PBWT can be calculated.

- Average Ship Berth-Day Output (OSBD)

Total Cargo handled by Vessels sailed/ Total Stay at Working Berth

- Outward Movement (OM)

This is the navigation time taken by a ship from the time of unberthing from the last berth till the vessel reaches reporting station.

- Average Non-working time (NWTB)

Total Non-working time at Working & Non-working Berths /Total Number of Vessels sailed

Inward Movement (IM)

This is the navigation time taken by a ship for moving from anchorage or reporting station to an operational Jetty/Berth/Mooring as the case may be. In case the navigation is first to non working berth, Inward Movement will be the time taken from anchorage point to non-working berth and time taken for shifting from non-working berth to operational berth/jetty/mooring.

CHAPTER-4

ANALYSIS & INTERPRETATION

4.1 DATA COLLECTION & MODELLING

The researcher has collected 10 years data from 'Basic Port Statistics" from Ministry of Ports, Shipping & Waterways for analysis and interpretation of performance of major ports of India.The data will help in identifying the performance of the ports in the county and also to measure the volume of cargo being imported and exported to India

4.2 ANALYSIS & INTERPRETATION

Table 4.1 : Indian State Wise Port Traffic In Million Tonnes

STATE	MAJOR PORTS	NON MAJOR PORTS	TOTAL
Gujarat	117.57	387.57	505.14
Maharashtra	118.13	39.84	157.98
Goa	21.99	0.04	22.02
Karnataka	36.5	0.79	37.29
Kerala	31.5	0.1 1	31.62
Tamil Nadu	101 .23	7.41	108.64
Andhra Pradesh	69.84	89.64	159.48
Orissa	1 14,55	43.03	157.58
West Bengal	61 .37,	0	61.37
Others(a)	0.00	8.88	8.88
TOTAL	672.68	577.3	1249.99

From the above data we can identify that Gujarat has become the top marine State among the States in terms of port traffic, handling 40.4% of all the cargo processed through Indian ports. It's also important to remember that 67.1% of the cargo handled by smaller ports is for the State of Gujarat. Gujarat is the state with the highest percentage of seaborne trade in India, followed by Andhra Pradesh (12.8%), Maharashtra and Odisha (12.6%), and Tamil Nadu (8.7%).

COMMODITY WISE TRAFFIC IN PORTS

Tab 4.2 Commodity wise traffic in Ports

Year	Crude & products	Iron Ore	Building materials	Coal	Fertiliz-Er Raw Material	OTHERS	TOTAL
2007-08	258.47	126.52	16.26	84.11	25.39	214.94	725.69
2008-09	272.02	128.53	13.26	98.38	27.13	204.7	744.03
2009-10	312.58	149.71	13.14	113.06	27.23	218.58	834.3
2010-11	325.26	125.95	12.33	133.61	33.52	254.77	885.44
2011-12	330.17	91.34	12.87	157.82	36.15	285.6	913.93
2012-13	349.29	49.14	10.95	196.07	27.35	299.95	933.75
2013-14	350.28	41.38	14.18	219.43	25.79	321.4	972.46
2014-15	333.94	43.02	14.22	275.1	30.35	355.6	1052.22
2015-16	367	32.7	14.17	275.93	32.97	348.99	1071.76
2016-17	386.3	76.22	15.17	259.93	28.29	367.78	1133.69
2017-18	406.68	77.77	15.59	273.41	26.77	408.35	1208.56
2018-19	412.69	83.64	16.16	308.58	31.64	429.07	1281.78
2019-20	418.79	95.65	15	297.4	32.11	461.01	1319.97
2020-21	348.69	107.32	13.89	256.77	31.36	491.96	1249.99

The entire traffic at Indian Ports' commodity composition has barely changed over time. POL and its products remain the top commodity handled by the ports, making up 27.90% of all seaborne traffic in 2020–21 as crude and its products are being shipped mostly to India which followed by coal (20.54%), iron ore (8.59%), and FRM (2.51%). Mostly raw materials are shipped from and to

India. the petroleum and crude oil trade is a significant contributor to port traffic in India. India is one of the largest importers of crude oil and petroleum products in the world, and the majority of these imports are handled through its ports. The demand for crude oil and petroleum products in India is high due to the country's growing population, urbanization, and industrialization.

The transportation of crude oil and petroleum products involves large volumes of cargo, and this results in a significant amount of port traffic. The major ports in India that handle these commodities are equipped with state-of-the-art facilities and infrastructure to ensure smooth and efficient handling of these cargoes. These ports are also strategically located along India's coastline, which makes them easily accessible to the major oil-producing countries in the Middle East and Africa.

India is one of the largest producers and consumers of coal in the world, and coal accounts for a significant portion of the country's energy requirements. As a result, there is a high demand for coal transport through India's ports. Many of the major ports in India, such as Mundra Port, Krishnapatnam Port, and Visakhapatnam Port, handle large volumes of coal shipments. Other commodities that also contribute significantly to port traffic in India include crude oil, iron ore, containerized cargo, and fertilizers.

CONTAINER TRAFFIC IN PORTS

Containerization started in India in 1973 in a limited way with the creation of interim container handling facilities at Mumbai and Cochin Ports. Since then, container traffic has steadily increased over the years, in tune with the increasing use of contai Container traffic has experienced about 120.3 million tonnes in 2011 143.7 million tonnes (9.6 mi from 558.06in 2019-20 million tonnes to Coal 16.9% Fertilizer 1.4% Fert. Raw Material 0.9% Food Grains 0.1% Others 41.5% Chart 4 Percentage share of commodity wise traffic handled at Major Port in 2019 XVI In respect of the traffic handled at Major ports, it is also observed that more than 2019-20 was accounted by three commodities viz. other cargo including %), POL & Products (31.4%) and Coal (16.9%). 10.

CONTAINER TRAFFIC

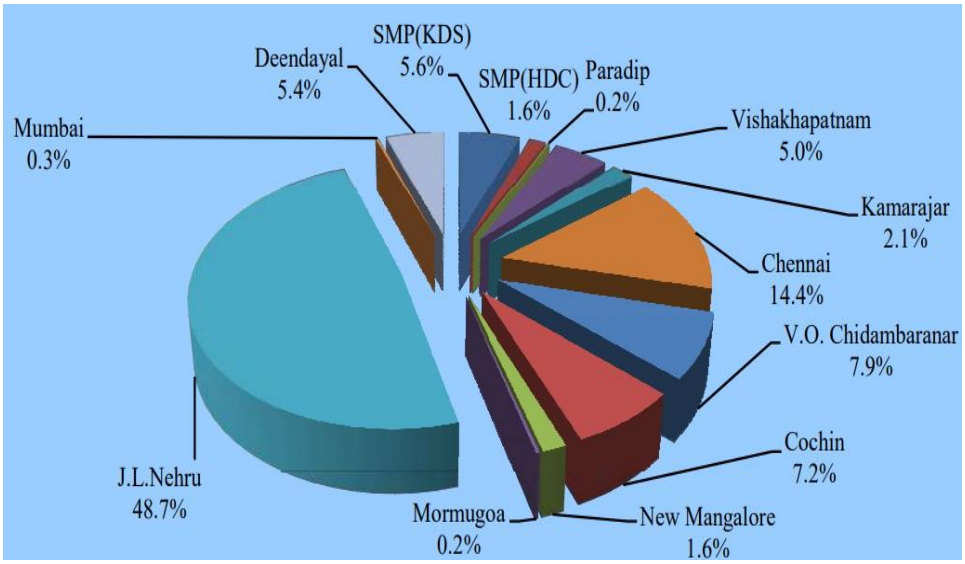

Fig 4.1 Container Traffic in Ports

Name of Port	**2019-20**		**2020-2021**	
	000' Tonnes	000' TEUs	000' Tonnes	000' TEUs
SMP Kolkata D.S	9767	675	8237	538
SMP Haldia D.C	3032	169	2927	149
Paradi	222	12	279	16
Vishakha atnam	8649	409	8178	481
Kamarajar	2524	128	3871	198
Chennai	26710	1384	26768	1387
V.O.Chidambaranar	16436	804	15023	762
Cochin	8628	620	9550	690
New Mangalore	2278	153	2291	150
Mormu ao	418	32	307	22
J.L.Nehru	60940	5031	57746	4677
Mumbai	291	27	255	25
Deenda al	6967	447	8279	515
All Ports	146861	9892	143710	9610

Table 4.3 State wise container traffic in Ports

Containerization started in India in 1973 in a limited way with the creation of interim container handling facilities at Mumbai and Cochin Ports. Since then, container traffic has steadily increased over the years, in tune with the increasing use of containers in international trade. Container traffic has experienced about 1.2 times increase from 101.3 million tonnes) in tonnes in 2011-12. It increased to 145.5 million tonnes in million TEUs) in 2020-21 (Chart-6).Non-containerized cargo million tonnes to 528.97 million tonnes in 2020-21 POL 31.4% Iron Ore 7.9% Coal 16.9% Chart 4 Percentage share of commodity wise traffic handled at Major Port in 2019-20 Fertilizer 1.5% Fert. Raw Material 1.1% Food Grains 0.2% Others 43.8% Chart 5 Percentage share of commodity wise traffic handled at Major Port in 2020 ports, it is also observed that more than 89% of was accounted by three commodities viz. other cargo including Containerization started in India in 1973 in a limited way with the creation of interim container handling facilities at Mumbai and Cochin Ports. Since then, container traffic has steadily ners in international trade. million tonnes) in 2009-10 to million tonnes in 2018-19 and decreased to containerized cargo declined 21.

PERFORMANCE OF MAJOR PORTS

CARGO TRAFFIC HANDLED IN MAJOR PORTS

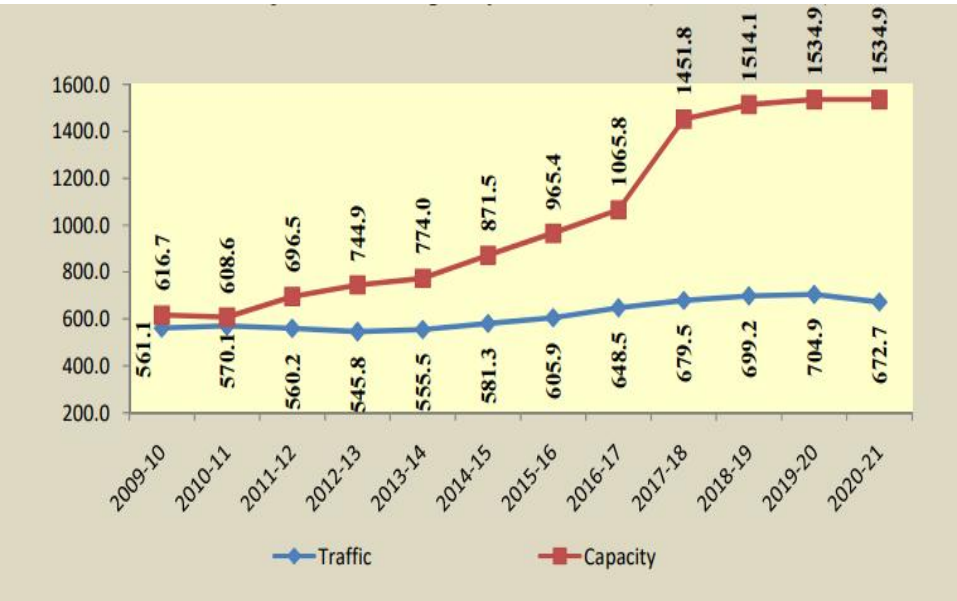

Fig 4.2 Capacity and Traffic in Major Ports

In 2020–21, the twelve largest ports in India handled around 53.81% of the nation's maritime freight. With the exception of 2011–12 and 2012–13, the volume of traffic handled at the major ports has increased during the past ten years in accordance with economic activity and trade

turnover. The major ports' total traffic increased by about 1.2 times from 561.1 million tonnes in 2009–10 to 672.68 million tonnes in 2020.

Major ports' ability to handle cargo has increased along with traffic. The capacity, which was estimated to be 616.7 million tonnes at the end of the 2009–2010 fiscal year, climbed to a level of 1514.1 million tonnes at the end of the 2018–19 fiscal year and further expanded to 1534.91 million tonnes in the 2020–21 fiscal year. The efficiency of cargo handling operations at India's major ports has improved as a result of the major ports' increased productivity and added capacity, as well as the growing involvement of the private sector in cargo handling. In 2019–20, the capacity utilization, which was 91.0% in 2009–10, dropped to 45.9%. Major ports' capacity utilization from 2009–2010 to 2021

Fig 4.3 Major Ports: Cargo Traffic In Terms Of Overseas And Coastal Traffic

The overseas and coastal cargo handled during 2020-21by major ports was of the order of 525.33 million tonnes and 147.35 million tonnes respectively. The Overseas Cargo traffic handled at Major Port recorded declineof3.6% in 2020-21 as compared to 2019-20 and the Coastal cargo traffic declinedby7.8% in 2020-21. However, the total cargo traffic handled in 2020-21 was decreased by 4.6% as compared to 2019-20. 8.2

The Cargo traffic in terms of coastal and overseas categories at Major Ports during 2019-20&2020-21 . Amongst the major ports, Deendayal Port (erstwhile Kandla port)accounted for the highest share of 17.5% in the total cargo traffic at all major ports during 2020-21 followed by

Paradip (17.0%), Vishakhapatnam (10.4%), J.L. Nehru (9.6%), Mumbai (7.9%), SMP (Haldia Dock Complex) (6.8%), Chennai (6.5%), NMPT (5.4%) and V.O.Chidambaranar Port &Cochin Port (4.7%).The cargo traffic atKamarjar Port, Mormugao Port, and SMP Kolkata Dock System (KDS) had a share of less than 4% each during the same period of 2020-21. The Cargo traffic at all the Ports was overwhelmingly outward oriented with overseas cargo accounting for the larger share in the total cargo handled at the port.

Port-wise analysis of the traffic growth indicates that Mormugao recorded highest growth of 37.4% during 2020-21followed by Paradip (1.6%).Other major ports like Kamarajar recorded a 91.093.7 80.4 73.3 71.8 66.7 62.8 60.8 46.846.2 45.943.8 40.0 60.0 80.0 100.0 Capacity Utilization (in Percentages) Chart 3: Major Ports - Capacity Utilization XIV highest negative growth (18.4%) followed by Mumbai Port (12.1%),V.O.Chidambaranar Port (11.9%), SMP (KDS) (8.1%), Cochin Port (7.4%), Chennai Port (6.9%), NMPT (6.8%), JNPT (5.3%), Deendayal Port (4.1%), Vishakhapatnam Port (4.0%) and SMP Haldia (2.6%) respectively.

CHAPTER 5
FINDINGS, SUGGESTIONS AND CONCLUSION

5.1 FINDINGS

- Vessel Traffic

One of the key findings from port traffic analysis is related to vessel traffic. The analysis of vessel traffic can provide information on the types of vessels calling at the port, their frequency of visits, and the countries they are coming from or going to. This information can be useful in understanding the trading patterns between countries and regions. For example, if there is an increase in the number of container ships calling at a port, it may indicate a growing demand for goods in that region. Similarly, if there is a decrease in the number of oil tankers calling at a port, it may indicate a decrease in the demand for oil in that region.

- The analysis of vessel traffic can also provide insights into the capacity of the port. If the analysis indicates that the port is operating at or near capacity, it may be necessary to invest in additional infrastructure to accommodate future growth. Similarly, if the analysis indicates that there is unused capacity at the port, it may be possible to attract new shipping lines or increase the frequency of existing shipping lines to increase the volume of trade through the port.
- Cargo Traffic
- Another key finding from port traffic analysis is related to cargo traffic. The analysis of cargo traffic can provide information on the types of goods being imported or exported through the port, their volume, and their origin or destination. This information can be useful in understanding the demand for goods in different markets and the supply chain logistics of different industries.
- For example, if the analysis indicates that there is an increase in the volume of electronic goods being imported through the port, it may indicate a growing demand for these goods in the local market. Similarly, if the analysis indicates that there is a decrease in the volume of agricultural products being exported through the port, it may indicate a decrease in the demand for these products in the global market.
- The analysis of cargo traffic can also provide insights into the infrastructure needs of the port. If the analysis indicates that there is a significant increase in the volume of goods being handled at the port, it may be necessary to invest in additional storage facilities, handling equipment, and transport infrastructure to ensure the efficient movement of goods through the

port.

- Economic Impact

Port traffic analysis can also provide information on the economic impact of the port on the local and regional economy. This can include the number of jobs created by the port, the amount of revenue generated, and the overall contribution to the GDP.

For example, if the analysis indicates that the port is a major employer in the local area, it may be necessary to ensure that the port continues to operate and expand to provide employment opportunities for local residents. Similarly, if the analysis indicates that the port is a major source of revenue for the local government, it may be necessary to ensure that the port remains financially sustainable and continues to contribute to the local economy.The analysis of the economic impact of the port can also provide insights into the wider economic benefits of the port. For example, if the analysis indicates that the port is a key enabler of international trade, it may be necessary to ensure that the port remains competitive and continues to facilitate the movement of goods and people between different countries and regions.

- Safety and Security

Port traffic analysis can also help identify potential safety and security risks associated with the movement of goods and people through the port. This can include the detection of hazardous materials or illegal activities such as smuggling.

5.2 SUGGESTIONS

- Implement a traffic management plan: Develop a plan that identifies potential congestion points and outlines strategies to manage traffic flow in and out of the port. The plan should also include guidelines for managing unexpected situations, such as accidents or inclement weather.
- Use technology to manage traffic: Implement a system of traffic lights, digital signage, and other technologies to help manage traffic flow in and out of the port. For example, intelligent transport systems can be used to manage traffic by adjusting traffic light timings based on traffic conditions.
- Provide adequate parking facilities: Ensure that there is sufficient parking space available for trucks and other vehicles waiting to enter or exit the port. This will help reduce congestion and keep traffic moving smoothly.

- Coordinate with shipping lines: Work closely with shipping lines and other stakeholders to manage arrivals and departures, and to ensure that cargo is loaded and unloaded in a timely manner.

- Promote sustainable transport: Encourage the use of sustainable modes of transport, such as rail and water transport, to reduce congestion on the roads leading to and from the port.

- Conduct regular traffic surveys: Conduct regular surveys to monitor traffic volumes, identify problem areas, and evaluate the effectiveness of traffic management strategies. This information can be used to fine-tune the traffic management plan and make adjustments as needed.

5.3 CONCLUSION

managing port traffic in India is a critical challenge that requires careful planning, coordination, and implementation of effective strategies. India has a long coastline and several major ports that serve as gateways for international trade and commerce. Efficient management of port traffic is essential for ensuring the smooth flow of goods and people and supporting the economic growth and development of the country.

Effective port traffic management in India involves several aspects, including infrastructure development, technology adoption, coordination with local authorities and private stakeholders, and promotion of sustainable transport modes. The development of infrastructure is critical for managing port traffic efficiently. The availability of adequate parking facilities, loading bays, and cargo handling equipment is essential for the smooth flow of traffic in and out of the port.
Technology adoption can also play a significant role in managing port traffic. Advanced technologies like real-time traffic monitoring systems, intelligent transport systems, and GPS-enabled tracking of vehicles can help predict congestion and provide alternate routes to avoid delays. The use of technology can also help improve communication and coordination between stakeholders and make traffic management more efficient.
Coordination with local authorities and private stakeholders is also important for the success of port traffic management efforts. Close collaboration with law enforcement, traffic management

agencies, and other relevant organizations can help ensure that traffic management efforts are coordinated and effective. Public-private partnerships can also be developed to incentivize the use of sustainable transport modes and support the development of necessary infrastructure.

Promotion of sustainable transport modes is another important aspect of port traffic management in India. Encouraging the use of rail and water transport can help reduce congestion on the roads leading to and from the port and improve air quality. It can also help reduce the carbon footprint of the transportation industry and support India's commitments to reduce greenhouse gas emissions.

In conclusion, managing port traffic in India is a complex task that requires a multifaceted approach. Effective management of port traffic can help ensure the smooth flow of goods and people and support the economic growth and development of the country. The development of infrastructure, adoption of advanced technologies, coordination with local authorities and private stakeholders, and promotion of sustainable transport modes are all essential elements of a successful port traffic management strategy in India

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