

**“A Study on Ro-Ro Terminal in Chennai Port Authority  
in Comparison with other Major Ports in Tamil Nadu”**

*A dissertation submitted to the School of Maritime Management,  
Indian Maritime University in the partial fulfilment of*

**Master of Business Administration  
in  
Port and Shipping Management**

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**UNDER THE SUPERVISION AND GUIDANCE**

**OF**

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**SCHOOL OF MARITIME MANAGEMENT**

**INDIAN MARITIME UNIVERSITY**

*(A Central University under the Ministry of Ports, Shipping and Waterways)*

**CHENNAI CAMPUS**

**May: 2023**

**SCHOOL OF MARITIME MANAGEMENT  
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**Certificate**

This is to certify that the project report titled “A Study on Ro-Ro Terminal in Chennai Port Authority in Comparison with other Major Ports in Tamil Nadu” is a bonafide work done by **Sujith L (Reg.No:- 2103304023)** in partial fulfilment of the requirement for the award of the degree of Master of Business Administration in Indian Maritime University, Chennai.

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## DECLARATION

I, **Sujith L**, do hereby declare that the dissertation entitled “**A Study on Ro-Ro Terminal in Chennai Port Authority in Comparison with other Major Ports in Tamil Nadu**” is exclusively a bonafidework done by me under the supervision and guidance of **Dr. Emil Mathew**, Assistant Professor, School of Maritime Management and is submitted to Indian Maritime University inpartial fulfilment of the requirement for the award of the degree of Master of Business Administration.

I further declare that no part of this report has been previously submitted to any other university or academic body for the award of any degree or diploma.

**Place : Chennai**

**Date : 10/05/2023**



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**Chapter – I**  
**INTRODUCTION**

## 1.1 Background

The maritime industry in India has undergone significant transformation in recent years, driven by various factors such as globalization, trade liberalization, technological advancements, and increasing demand for efficient and cost-effective transportation solutions. One of the key sectors that have gained prominence in the Indian maritime landscape is the Roll-on/Roll-off (Ro-Ro) industry, which refers to the transportation of wheeled cargo, such as automobiles, trucks, and trailers, on specialized vessels or barges that allow them to be driven on and off the ship's deck.

Ro-Ro transportation is becoming increasingly popular in India due to its advantages over traditional cargo handling methods, such as reduced transit time, lower logistics costs, improved reliability, and better environmental sustainability. According to a report by the Indian Ministry of Shipping (2019), the Ro-Ro industry in India has grown at a CAGR of 6.5% from 2014-15 to 2018-19, and is expected to continue its upward trajectory in the coming years.

One of the prominent Ro-Ro ports in India is the Chennai Port, located on the eastern coast of Tamil Nadu. The Chennai Port has been a major gateway for Ro-Ro transportation in South India, catering to the needs of various automobile manufacturers, logistics providers, and other stakeholders in the region. However, there are other ports in Tamil Nadu that also offer Ro-Ro services, such as Kamarajar Port, V.O. Chidambaranar Port, among others.

Given the growing importance of the Ro-Ro industry in Tamil Nadu and the significant role played by Chennai Port in this sector, there is a need for a comprehensive comparative analysis of the Ro-Ro terminal operations and management practices in Chennai Port and other ports in Tamil Nadu. This study aims to address this research gap by examining the key features and characteristics of Ro-Ro terminals in these ports, evaluating their performance and efficiency based on various criteria, identifying the drivers and barriers of Ro-Ro terminal development and expansion, and providing recommendations for improving the Ro-Ro terminal operations and management in Tamil Nadu.

The Ro-Ro (Roll-On Roll-Off) terminal in Chennai Port is a specialized facility for the transport of wheeled cargo such as trucks, trailers, and cars. The terminal is located at the northern end of Chennai Port, adjacent to the Chennai Container Terminal.

The Ro-Ro terminal in Chennai Port has been operational since 2015 and is operated by the Chennai Port Authority. The terminal has a quay length of 200 meters and a draft of 8 meters, which can accommodate vessels carrying up to 250 trucks and trailers. The terminal is equipped with modern facilities for the handling and storage of wheeled cargo, including specialized ramps, tractors, and trailers.

The Ro-Ro terminal in Chennai Port plays a vital role in facilitating the transport of cargo between different parts of India, as well as with other countries in the region. The terminal provides a cost-effective and efficient mode of transportation for wheeled cargo, which is especially important for industries such as automobile manufacturing, where timely delivery of components and finished products is critical.

In addition to the Ro-Ro terminal, Chennai Port also has facilities for the handling of other types of cargo, including containerized cargo, bulk cargo, and liquid cargo. The port is one of the busiest in India, handling over 50 million tons of cargo annually.

#### **1.1.1. Roll-on/Roll-off**

Roll-on/Roll-off are vessels designed to carry wheeled cargo such as automobiles, trucks, semi-trailers and rail road cars that driven on and off the ship on their own wheels. This is in contrast to lo-lo vessels which use a crane to load and unload cargo.

#### **1.1.2. Types of Ro-Ro**

Various types of RORO vessels include ferries, cargo ships, and barges. New automobiles that are transported by ship are often moved on a large type of RORO called a pure Car Carrier. Unlike other cargos which are measured in metres by the number of decks and by its width in lanes.

The Largest Ro-Ro passenger ferry is MS Color Magic, a 75000 GT cruise ferry that entered service in September 2007 for Color Line. Built in Finland by Aker Finnyards, it is 223.70 m long, 35 m wide and can carry 550 cars/ 1270 lane meters of cargo.

The Ro-Ro passenger ferry with the greatest car-carrying capacity is the Ulysses which is owned by Irish Ferries. The Ulysses entered service on 25 March 2001 and operates between Dublin and Holyhead. The 50938 GT ship is 209.02 m long and 31.84 m wide, and can carry 1342 cars/4101 lane meters of cargo.

### **1.1.3. History and development of Ro-Ro vessel**

At first, wheeled vehicles carried as cargo on oceangoing ships were treated like any other cargo, Automobiles had their fuel tank emptied and their batteries disconnected before being hoisted into the ships holds, where they were chocked and secured. This process was tedious and difficult, vehicles were subject to damage, and could not be used routine travel.

The world's first RORO service was a train ferry, started in 1833 by Monkland and Kirkintilloch Railway, which operated a wagon ferry on the forth and Clyde canal in Scotland. The first RORO vessel that was purpose-built to transport loaded semi-trucks was the Searoad of Hyannis, which began operation in 1956.

Since 1970 the market for exporting and importing cars has increased dramatically and the number and type of RORO has increased also. In 1973 Japan's K line built European Highway, the first pure car carrier, which carried 4200 automobiles. With the building of Wallenius Logistics' 8000 CEU car carrier Faust out of Stockhplm in June 2007 car carriers entered a new era of the truck carrier.

### **1.1.4. Seaworthiness**

A sea going RORO car ferry, with large external doors to the waterline and open vehicle decks with few internal bulkheads, has a reputation of being a high risk design. An improperly secured loading door can cause a ship to take on water and sink. Water sloshing on the vehicle deck set up a free surface effect making the ship unstable and causing it to capsize. Despite all these inherent risks, the very high free board raises the seaworthiness of these vessels.

### **1.1.5. Types of Ro-Ro Vessel**

#### **1.1.5.1. ROPAX**

The acronym ROPAX describes a RORO vessel built for freight vehicle transport along with passenger accommodation. Technically these encompass all ferries with both roll on/roll off car deck and passenger-carrying capacities, but in practice ships with facilities for more than 500 passengers are often referred to as ferries.

### **1.1.5.2. ConRo**

The ConRo vessel is a hybrid between a RORO and a container ship. This type of vessel has below-decks area used for vehicle storage while stacking containerised freight on the top decks. Examples such as those in the fleet of Atlantic Container Line can carry a combination of 1900's TEU and up to 2000 automobiles on its five decks.

### **1.1.5.3. RoLo**

A RoLo vessel is another hybrid vessel type with ramps serving vehicle decks but with other cargo decks only accessible when the tides change or with the use of a crane.

### **1.1.5.4. LMSR**

Large, Medium – Speed Roll on/Roll off refer to several classes of Military Sealift Command Roll on/Roll off type cargo ships. Some are purpose – built to carry military cargo, while others are converted.

### **1.1.5.5. Car Carriers**

Car carriers are vessels designed to carry new automobiles at large quantities. As a result of globalization, automobile manufacturers needed their products to be distributed to the international market and the first car carrier has been built in 1973. Pure Car Carrier, Pure Car and Truck Carrier, and Large Car and Truck Carrier are varieties of car carriers. Car Carriers can be described as floating auto parks offering ocean passing service for thousands of cars on a single sailing.

### **1.1.6. Loading of Ro-Ro Cargos**

Vehicles are driven inside the ship and secured onto the vessel's car deck. It is simple, economical and fast when compared to the loading of other cargoes. Precisely, that is RORO vessel's handling. These vessels also carry non-motorized vehicles such as boats on trailers and non-road worthy vehicles like heavy plant and machinery on steel tracks.

On RORO vessels all cargo is shipped under deck secured in the hold, wind and water tight. No packing is required.

## **1.2 Objectives and scope of the study:**

1. To analyse the operational efficiency and effectiveness of Ro-Ro terminals in Chennai Port and other ports in Tamil Nadu.
2. To identify the key factors that influence the success of Ro-Ro terminals in Chennai Port and other ports in Tamil Nadu.
3. To compare the performance of Ro-Ro terminals in Chennai Port and other ports in Tamil Nadu.

### **1.2. Scope of the Study:**

1. The study will focus on the Ro-Ro terminal in Chennai Port and other ports in Tamil Nadu.
2. The study will analyse the current status of Ro-Ro terminals, including their infrastructure, operations, and regulations.
3. The study will evaluate the performance of Ro-Ro terminals in terms of their throughput, turnaround time, and customer satisfaction.
4. The study will compare the performance of Ro-Ro terminals in Chennai Port and other ports in Tamil Nadu, taking into consideration their location, size, and capacity.

### **1.3. Significance of the study:**

In recent years, Ro-Ro terminals have gained increasing importance in the maritime industry, as they offer several advantages, including faster turnaround times, higher cargo volumes, and lower operational costs. However, the success of Ro-Ro terminals depends on several factors, such as infrastructure, operations, regulations, and market demand.

In the context of Chennai Port and other ports in Tamil Nadu, the body of knowledge on Ro-Ro terminals is relatively limited, with few studies focusing on their performance and management. However, some research has been conducted on the Ro-Ro terminals in India

and other parts of the world, providing valuable insights into the best practices and strategies to improve their efficiency and effectiveness.

## **1.2. Overview of the research methodology:**

The study is based on secondary data collected, processed, and published by Port authorities, car manufacturers for a different purpose. This data can be in various forms, including published reports, books, articles, online databases.

For finding data on the performance of Ro-Ro terminal in Chennai port for the past six years, official reports and statistics published by the port authority, such as the Chennai Port Authority and reports by organizations like the Ministry of Shipping, Government of India, and industry associations like the Indian Ports Association are analysed.

Sources of data that are explored to gather information on the performance of Ro-Ro terminal in Chennai port are

1. Annual reports of the Chennai Port Trust: The Chennai Port Trust publishes annual reports that provide information on the port's performance, including cargo volumes, vessel traffic, and financial performance.
2. Monthly and quarterly traffic reports: The Chennai Port Trust also publishes monthly and quarterly traffic reports that provide data on cargo volumes and vessel traffic by type of cargo and vessel.
3. Reports by the Ministry of Shipping: The Ministry of Shipping, Government of India, publishes reports on the performance of major ports in India, including Chennai port.
4. Reports by industry associations: The Indian Ports Association, which represents the interests of major ports in India, publishes reports on the performance of Indian ports.

By consulting these sources, information on the performance of Ro-Ro terminal in Chennai port for the past four years, including cargo volumes, vessel traffic, and other relevant metrics are analysed.

## **1.6 Limitations of the Study**

Main limitation is the short time frame of one month for conducting the study, which may not have allowed for a comprehensive analysis of the Ro-Ro industry in Tamil Nadu.

Additionally, the study's authors were not able to visit the area for data collection, which may have limited their understanding of the local context and conditions.

The limited data available may have also impacted the study's ability to draw reliable conclusions or make informed recommendations for improving Ro-Ro terminal operations and management in Chennai Port and other ports in Tamil Nadu.

To address these limitations, future research should consider using a more comprehensive data collection methodology, including primary data from multiple sources and on-site visits to Ro-Ro terminals in Tamil Nadu. The study could also consider a longer time frame to gather more comprehensive and accurate data. Additionally, the study could benefit from a broader scope that considers the economic and environmental impacts of the Ro-Ro industry in Tamil Nadu and the potential for intermodal connectivity and multimodal transport solutions.

**CHAPTER II**  
**Literature Review**

In this chapter articles, online journals, reports, websites and other published sources that are related to the study area are referred. The source from which this information is collected are given.

### **2.1. Definition and concept of Ro-Ro terminal:**

by Kaya and Oraman (2020), Ro-Ro terminals are facilities that are specifically designed for the efficient loading and unloading of Roll-on/Roll-off ships. These facilities are used for the transportation of wheeled cargo such as cars, trucks, trailers, and other similar vehicles. Ro-Ro terminals often have specialized equipment for loading and unloading cargo, as well as storage facilities for vehicles waiting to be transported.

Another article by Wallenius Wilhelmsen explains that Ro-Ro is short for "Roll-on/Roll-off," which describes how products are loaded and discharged from a vessel. Unlike traditional cargo ships, Ro-Ro ships allow cargo to be driven or towed onto the ship, and then driven or towed off again at the destination. Ro-Ro terminals are designed to accommodate this type of cargo handling, with ramps and other specialized equipment to facilitate the loading and unloading of vehicles.

### **2.2. Automotive Ro-Ro terminals are responsible for the storage, loading and unloading of commercial cars**

Automotive Ro-Ro terminals are responsible for the storage, loading and unloading of commercial cars (Iannone et al., 2016, Ishii et al., 2013). Despite their low costs, ports face fierce competition from road and railway transport due to their fewer manual operations and higher efficiency. Low-efficiency operations in Ro-Ro terminals increase the risk of disturbance to ship schedules, and result in port traffic congestion (Maksimavicius, 2004). Regarding tidal harbors, a high ship-loading efficiency is required to avoid ship departure delays. Additionally, unlike shipping containers, commercial cars cannot be stacked in a yard (Iannone et al., 2016). With the increase in commercial cars, limited storage resources have constrained the development of Ro-Ro terminals. For administrators, improving the ship-loading efficiency and the efficient use of storage resources to promote the competitiveness of Ro-Ro terminals is a major challenge.

Unlike ship-loading operations in container terminals, in automotive Ro-Ro terminals, the use of auxiliary equipment—such as quay cranes (QCs), yard cranes (YCs), automated

stacking cranes (ASCs) and inner trucks (ITs)—is unnecessary. The loading of commercial cars into ships at Ro-Ro terminals is directly carried out by drivers. Finding storage locations for individual cars as rapidly as possible is very important for ship-loading efficiency; thus, it is beneficial for drivers to spend minimal time searching for loaded cars. Therefore, a rational car layout is more important in Ro-Ro terminals than in container terminals.

In actual yard management, a Ro-Ro terminal will charge suppliers (customers) an extra storage fee once their commodities are stored in the yard for a time exceeding a certain limit. For example, in the Shanghai Haitong Ro-Ro Terminal, if commercial cars are stored at the yard for less than one week, then the storage is free. Hence, commercial cars from different suppliers arrive gradually at the Ro-Ro terminal over the course of one week. The loading operations of cars into a Ro-Ro ship are very intensive.

The yard region of automotive Ro-Ro terminals is usually divided into many zones. Commercial cars that need to leave the port together are usually stored in interconnected parts of the yard (Fischer and Gehring, 2005; Iannone et al., 2016). However, although the cars loaded into the same ship are assigned to one or more adjacent zones, the layout of cars possessing the same ship-loading sequence may still be scattered throughout the selected zone/zones.

### **2.3. Some elements of RO-RO terminals – Ricardas Maksimavicius (2004)**

This article provides a detailed analysis of the elements that make up a Ro-Ro terminal. The author notes that Ro-Ro terminals are different from traditional cargo terminals in several ways, particularly in terms of the variables that affect terminal capacity. For example, Ro-Ro terminals do not require cargo handling equipment, since the cargo is wheeled on and off the ship. Additionally, Ro-Ro cargo cannot be stacked, which affects how the terminal is designed and laid out. Sea freight accounts for the major part in ro-ro freight transportation schedule, due and timely processing of cargo and preparation for shipment are to be particular extent affecting the ro-ro freight duration. It is therefore essential to minimize the freight processing time at the Ro-Ro terminal. Otherwise, the ship schedule might be interfered and even the operation of a terminal itself and port traffic is affected.

Another problem to be encountered quite often is that often ro-ro terminal is not the position to physically accept and process the arriving freight. This is mainly per-conditioned by an insufficient number of terminal gateways, the shortage of customs and border control

facilities. This study defines, while developing the ro-ro liner shipping and freight transportation, numerous factors have to be considered so that to enable possible minimization, when it comes to issues of freight processing and preparation for ro-ro transportation there are certain aspects to be noted that are enhancing and optimizing ro-ro ship processing, close operation and interaction between terminal and shipping line. Ensuring proper terminal operation and efficient ship processing a certain number of CTU ready for embarkation must be available what might be achieved by due increase of terminal gateway throughput, customs and border control facilities. Increased number of gateways (throughput), customs and border facilities alone, cannot be always resolve the issue of timely and due freight processing, as long as the terminal accommodating storage facilities remain insufficient and misarranged. All terminals facilities like gateways, customs and border control and accommodating storage sites and their arrangement have to be duly adjusted and coordinated.

#### **2.4. The role of European ro-ro port terminals in the automotive supply chain Management:**

J.C.Quaresma Dias, J.M.F. Calado, M.C. Mendonça

The purpose of this article is to create and construct a practical framework for the management of the European automotive supply chain while taking into account outbound distribution. Furthermore, it finds that the function of ro-ro port terminals should be viewed as poles, postponement platforms, and a readjustment of traditional concepts and terminology. Case studies look at important Western European ro-ro port terminals for automobiles and their connections to localised assembly/factories of vehicles and come to the conclusion that ro-ro port terminals improve space/time compression and minimise logistical friction and impedance. According to the study's findings, ro-ro port facilities are already playing a new role in the channels used to distribute vehicles. They may be thought of as a DP, the last physical layer before the final consumer and also a logistical platform for delay. By compressing time and space during the distribution of automobile SC, these port terminals increase cost savings. The current article has added to the literature on distribution operations, specifically in the European automobile SCM, and the empirical investigation supports the earlier theoretical claims. Its primary contribution may be to close the integration gap in the marine mode, and as a result, the new function of ro-ro port terminals in such value chains. Furthermore, it does not rule out the possibility that the formation of logistical dipoles, viewed here as a tool for integrating the maritime mode in outbound

automotive SCM, could be extended to other functions or modes. Such a configuration may even be used in other parts of Europe, or for various sorts of commerce such as containers, bulk, or a variety of general cargos. However, any generalisation or adaptation of the current theoretical framework to other contexts may necessitate both a new theoretical demonstration and empirical validation via new specific studies.

## **2.5. Review of existing studies on Ro-Ro terminals in India and Tamil Nadu**

Coastal shipping in India is gaining importance with positive government intervention. The Sagarmala project spearheaded by the Sagarmala Development Company talks about some 415 projects identified for port modernization and new port development, port connectivity enhancement, port-linked industrialization, and coastal community development. It has a projected cost of USD 123 billion to be expended over 10 years, starting in 2015 and ending 2025 (Make in India 2018). It gives impetus to logistics organizations to recognize the high importance of waterways as a transport medium. Rabindra Kumar Agarwal, joint secretary (Sagarmala), said that there is potential for the transportation of coal, steel, cement, fertilizers, and automobiles through coastal shipping (Behera 2018). On October 28, 2017, a consignment of 185 trucks was shipped from Chennai Port on the ro-ro ship MV IDM Doodle to Bangladesh, a key market for the Indian firm Ashok Leyland, a major manufacturer of commercial automobiles. The level of interest shown by the Government of India (GOI) is evident from the fact that the maiden voyage of this ro-ro service was flagged off by Union Minister for Shipping Nitin Gadkari through a video conference (Press Information Bureau 2017). Despite all the initiatives, the advantages of coastal shipping are still not convincing enough for the automotive industry to develop sustainable logistics solutions. Link Shipping, a shipping company, tried coastal voyage way back in 2016 when 800 Hyundai cars were shipped on ro-ro vessels from Chennai to Port Pipavav in Gujarat for distribution in northern India. But the coastal movement could not be sustained because there was no return cargo from Gujarat ports to southern India. The ship operator tried its best to rope in Maruti and other auto manufacturers based in northern India but did not succeed. Besides this, the high port fees also turned out to be a demotivating factor for the shipping lines (Cross 2016). Then in September 2016, another logistics firm tried by pooling the cars manufactured by Hyundai, Nissan, Daimler, and Ford from Chennai. The company chartered a foreign flagged vessel to carry these cars from Kamarajar Port Limited in Ennore, close to Chennai, to the ports in Gujarat. After five or six voyages, this firm also gave up the attempt,

saying that it was not a paying proposition. The company, however, indicated that it would soon resume such services (Hindu Business Line 2018).

## **2.6. Comparison of Ro-Ro terminals in Chennai port and other ports in Tamil Nadu:**

A study by Sanyal and Sengupta (2018) analysed the performance of Ro-Ro terminals in India and identified the key challenges and opportunities for their growth. The study recommended the adoption of technology-enabled solutions, such as real-time monitoring and automated handling systems, to improve the operational efficiency of Ro-Ro terminals.

Another study by Mitra et al. (2019) evaluated the operational efficiency of Ro-Ro terminals in India, using a data envelopment analysis (DEA) approach. The study found that the Ro-Ro terminals in India had low efficiency levels, mainly due to inadequate infrastructure, equipment, and operational practices.

In the context of Chennai Port, a study by Prasad and Dharani (2014) analyzed the potential for Ro-Ro services in the region and recommended the development of a dedicated Ro-Ro terminal to enhance the port's competitiveness. The study highlighted the need for collaboration between the port authorities and the private sector to attract investment and promote the growth of Ro-Ro services in Chennai Port.

## **2.7. Optimizing storage location assignment in an automotive Ro-Ro terminal :**

Xiaojing Chen, Feng Li, Bin Jia, Jianjun Wu, Ziyou Gao, Ronghui Liu

Stowage planning is one of the most difficult and important operational tasks in liner shipping. To help ship operators make stowage plans safer, this paper presents a semi-automated approach to creating stowage plans for Roll-on/Roll-off (Ro-Ro) ships. Based on the ship's design data, accurate two-dimensional (2D) models of vehicle decks for stowage planning are established firstly. After the vehicle types for different stowage areas have been specified manually, a more realistic stowage plan is generated using an improved lowest horizontal line searching algorithm, which maximizes the deck utilization with the constraints of obstacles and ramps. Then, the ship's flotation, stability and strength under the loading plan are assessed by using a practical method verified by Lloyd's Register (LR) test cases. Finally, computational tests on a 3800 Pure Car and Truck Carrier (PCTC) are

performed and discussed, showing that the proposed method can make comparable stowage plans to that given by the ship's final loading manual and can be used onboard to improve navigation safety.

## **2.8. Capacity Analysis of Ro-Ro Terminals by Using Simulation Modeling Method**

min Deniz ÖZKAN<sup>a</sup>, Selçuk NAS<sup>b</sup>, Nil GÜLER<sup>c</sup>

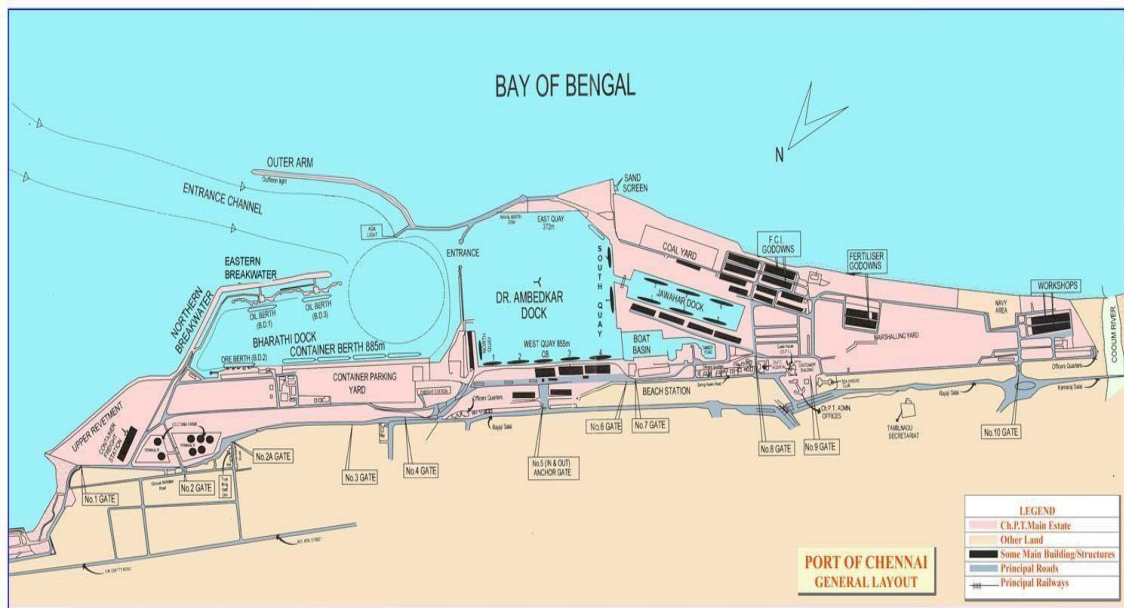
In Ro-Ro terminals, terminal capacity is more needed than other types of marine terminals since Ro-Ro cargoes cannot be stacked. In this sense, the variables affecting capacity of a Ro-Ro terminal can be listed as follows; number of vehicles arrived to a terminal, distance between terminals, ship capacity, terminal gates, customs control units, terminal traffic and local traffic, security check, bunkering services etc. In this study, a model generated intended for making capacity analysis in Ro-Ro terminals by using simulation modeling method. Effect of three variables to terminal capacity was investigated while generating the scenarios; 'number of trucks arriving to terminals', 'distance between terminals' and 'Ro-Ro ship capacity'. The results show that the variable which affect terminal capacity mostly is 'number of trucks arriving to terminals'. Because of this situation, it is thought that a Ro-Ro terminal operator must prioritize the demand factor and make an effective demand forecasting in determination of the terminal area. This study is helping in knowing about the capacity of the Ro-Ro terminal.

## **CHAPTER III**

### 3.1. Profile and overview of Chennai port Ro-Ro terminal

#### 3.1.1. Port Profile:

Figure 1. Chennai Port layout



The third-oldest of the 12 major ports, Chennai Port, is a developing hub port on India's east coast. After 137 years of illustrious service to the nation's marine trade, this port serves as the entryway for all cargo.

Maritime trade first began in Chennai, which is located on the coast, in 1639. Up until 1815, the sandy coast was exposed and the roadstead was open. The original piers were constructed in 1861, but were rendered useless by the storms of 1868 and 1872. As a result, a man-made harbour was constructed, and operations began in 1881. On Chennai's northern pier, which is on the north-eastern side of Fort ST. George, cargo activities were conducted. The port recorded traffic during the first few years.

The port was exposed to cyclones, and the accumulation of sand in the basin from undersea currents decreased the draught. Sir Francis Spring, a brilliant thinker, created a long-term strategy to map the port's destiny in a methodical way while overcoming both natural and artificial obstacles.

The port was greatly sheltered from the natural vulnerabilities by moving the entrance from the eastern side to the north-eastern side. By the end of 1920, the port had transit sheds, warehouses, a marshalling yard, and a dock with four berths in the West Quays, one in each

of the East and South Quays to make it easier to move freight from land to sea and vice versa. Following India's independence, the port began to grow and gain speed. The Jawahar dock, which can accommodate six vessels and can handle dry bulk goods like iron ore, fertiliser, and non- hazardous liquid cargoes, was built in 1964, altering the terrain of the port.

The Port has developed into a hub port for containers, cars, and project cargo on the East Coast, with three docks, 26 slots, and draughts ranging from 8.5 m to 16.5 m. Chennai Port, which operates its own railroad operations inside the harbour and had a terminal shunting yard. The port has eight sidings and railway lines with a total length of 41 km that can handle a variety of cargo, including dry bulk, granite, and food grains.

#### **HIGHLIGHTS:**

- India's second Largest Container Terminal – Handled **1.47 Million TEUs (2022-23)**
- Has operated by two Container Terminals – Being operated by global players.
- Two Liquid Terminals catering to Oil majors **CPCL / IOCL**.
- Connected with **32 CFSs & 1 ICD**
- State of the Art **Cruise Terminals**, extending rationalized tariff for Cruise vessels.
- Has entered agreements for handling **Hyundai and KIA Motors** export cars.
- Has entered agreement to promote handling of Transshipment containers.
- Periodical Monitoring and testing of environmental parameters inside Port premises.

### 3.1.2. Chennai port Ro-Ro Terminal:

Figure 2. Chennai port Ro-Ro terminal



The Chennai Port is located on the east coast of India, in the state of Tamil Nadu. It is the second-largest port in India in terms of container traffic and the fourth-largest in terms of overall traffic. The port has a total of 24 berths, including 3 container terminals, 2 bulk cargo terminals, and a Ro-Ro terminal.

In the year 2020-21, the Chennai Port handled a total of 53.02 million tonnes of cargo, which included 15.81 million tonnes of container traffic, 27.67 million tonnes of bulk cargo, and 9.54 million tonnes of other cargo. The port also handled a total of 1.63 million TEUs (twenty-foot equivalent units) of containers in the year 2020-21.

The Chennai Port has undergone several modernization and expansion projects in recent years, including the construction of new container terminals and the development of a dedicated car terminal.

The Ro-Ro terminal at Chennai Port has a capacity to handle up to 200,000 units of Ro-Ro cargo annually and serves as a key gateway for the movement of cargo and passengers to and from South India. The Chennai Port is well-connected to the hinterland through road, rail, and inland waterway networks, providing easy access to major markets in Tamil Nadu and neighbouring states.

Hyundai Motor India Ltd (HMIL) has renewed its agreement with Chennai Port Trust (ChPT) for the next 10 years on similar lines as the previous agreement signed in 2006.

Under the new agreement, HMIL will export a minimum of 50,000 cars (same as last time) annually through the port. ChPT will provide 20 days of free storage of cars at the port, priority berthing of vessels and exemption from double berthing charges.

(Double berthing charges usually come into play if the ship is moved to the outer anchorage due to non-availability of cargo, and returns once it is ready. This involves two moves, and hence, two charges.)

A press release from Hyundai said: “We decided to renew our contract with the Chennai Port Trust as the terms and conditions and facilities offered by them suit our requirements the best,” said YK Koo, MD & CEO, HMIL, who signed the agreement with ChPT Chairman P Raveendran.

Chennai port competitive pricing helps exporters keep their overheads low, which is a definite advantage in the global market. The port is committed to a clean environment free from any pollution, which is a huge advantage for lifestyle cargo like cars, as there is no fear of contamination.

For Chennai port, the agreement with Hyundai is important considering the South Korean major has been exporting its cars through the port for the past 17 years, and is its biggest revenue contributor. It has stayed with the port while other car manufacturers like Nissan and Toyota have moved to Kamarajar port for exports.

HMIL exports its cars to various destinations including Europe. However, its volume has been falling over the last few years as key markets, including West Asia, have showed a steady decline. Further, the company’s Turkey plant has been catering to some of the markets that the Indian plant earlier used to export to.

BusinessLine quoted ChPT traffic manager B Vimal as saying that they considered many factors which Hyundai is facing while deciding on the agreement.

Under the agreement, for up to one lakh cars, the wharfage concession will be 50 per cent of the port’s scale of rates; for above one lakh units, it will be over 70 per cent. For up to 20 ship calls, the vessel-related charges will be 10 per cent; the charge increase as the calls go up.

### **3.1.3. Completed Infrastructure Projects**

#### **1. Widening of Port Arterial Roads:**

To cater to the future traffic, Chennai Port has carried out the work of widening of port arterial roads to cater the Container trailer traffic for the container terminals.

#### **2. Development of Coastal berth:**

In order to give momentum to coastal shipping, Chennai Port commissioned the project of 'Coastal Berth' on 21.11.2019. The work comprises of construction of 260 m long Coastal Berth including dredging upto (-) 11.88M CD at the northern sheltering arm with backup area reclamation of 1.6 hectares. Capacity for handling General Coastal cargo of 1 MTPA will benefit growth of Coastal cargo. It will reduce the delays caused due to Port related paperwork and customs formalities thus save time and enhance overall Trade.

#### **3. Development of paved storage yards for handling Export cargoes:**

Development of Paved Storage yards for a total extent of 11.32 ha. was developed at ONB Yard and backup area of JD(E) & JD(S) for handling a variety of dry bulk cargoes in a clean manner without emanation of dust. In future premium cargoes including Containers, Cars and Project cargo can also be handled at these yards. The Paved Storage Yard completed in May 2019.

#### **4. Strengthening of Jawahar Dock:**

"Balance work of Modernization of JD at portions of JD 4 & JD 6 and dredging alongside JD 4 & JD6" was completed on 22.11.2019 for the entire depth alongside JD (East) is increased to (-) 14 m CD which will enable berthing of bulk cargo vessels upto 60000 DWT for which there is demand from the trade.

#### **5. DPE facility at Thiruvottiyur Parking Yard:**

A Parking Yard situated near the Chennai Port at Thiruvottiyur (TVT) has been declared as an extended gate of Chennai Port for Direct Port Entry (DPE) of export containers. The operation started on 03.09.2018. with full fledged capacity. In addition "O "yard area within Chennai Port has been identified for clearance of DPE containers by Customs Department.

## **6. Common Railway Yard:**

Chennai Port has developed a common Railway yard in the west of the existing Western Yard of the Port Marshalling Yard at a total cost of Rs.19.5 crores. This platform is of size 700m long and 30m wide with rail lines at both the sides to facilitate full rake handling. The project was completed in February 2018.

## **7. Chennai Ennore Port Road Connectivity Project (formerly EMRIP):**

This 30 km road project connecting the Port to NH 5 involves upgradation and widening of the north Chennai City Roads including Ennore Expressway, Tiruvottiyur-Ponneri Panchetti Roads, Manali Oil Refinery Road & Northern segment of Inner Ring Road is being implemented by NHAI. Chennai Port is one of the SPV partners with NHAI, KPL & GoTN has paid its entire equity share of Rs.139.80 Cr. The road work is almost completed except 300 m stretch inside the Fishing Harbour due to relocation of fishing stalls from the alignment of road. After continuous pursuance of Chennai Port with the concerned departments of GoTN, evacuation of fishing stalls was carried out on 08.3.2019 and NHAI was requested to secure the demolished/evicted area in the EMRIP alignment and restart the work immediately. In turn, NHAI provided the temporary fencing work along the 300 m stretch of the road alignment. NHAI, awarded contract for completion of balance portion of road in the 300m stretch inside Fishing Harbour. Now the Project work has been completed and put to use in March 2022.

## **8. Installation of Scanners**

Chennai Port is increasing the Security Profile by installing one Drive through Container Scanner for which work order was placed on 16.10.2019 with 15 months delivery period. The DTCS equipment delivered at ChPT on 23.02.2021 after the Factory Acceptance Test (FAT). 100% civil work has been completed. Site Acceptance Test (SAT) has been conducted from 22.02.22 to 25.02.22. The Container Scanner was inaugurated by the Hon'ble Minister for MoPSW on 14.08.2022 and is in operation. The designed throughput of this Drive through Container Scanner is 100 containers per hour. Trade will be benefitted with this Project, as scanning process will be faster and will save both time and cost for all the stakeholders.

## 3.2. Profile and overview of other ports in Tamil Nadu with Ro-Ro facilities:

### 3.2.1. Kamarajar Port Limited:

Figure 3. Kamarajar port Limited



Kamarajar Port, also known as Ennore Port, is a deep-water seaport in Chennai, India. It is named after former Tamil Nadu Chief Minister K. Kamaraj, who was noted for his contributions to the state's growth. The port was formally inaugurated in 2001 and is maintained by the Kamarajar Port Limited, a government-owned enterprise. Located on the Coromandel Coast about 24 km north of Chennai Port, Chennai, it is the 12th major port of India, and the first port in India which is a public company. The port was declared as a major port under the Indian Ports Act, 1908 in March 1999 and incorporated as Ennore Port Limited under the Companies Act, 1956 in October 1999. The Kamarajar Port is the only corporatized major port and is registered as a company. Today, the landlord port is the dominant port model in larger and medium sized ports.

The port is strategically placed on India's eastern coast and is well connected to major highways and trains, making it a key gateway for international trade. It has a natural depth of roughly 12.5 metres and can accommodate big boats including bulk carriers. The port features two berths for container ships, four berths for dry bulk cargo, and two berths for liquid cargo.

Kamarajar Port's Ro-Ro (Roll-on/Roll-off) terminal is a specialized facility that provides a seamless link between the port and the hinterland for the movement of wheeled cargo such as cars, trucks, trailers, and other heavy machinery. The Ro-Ro terminal allows cargo to be directly driven onto the vessel at the port and driven off at the destination, without the need for cranes or other equipment for loading and unloading.

The Ro-Ro terminal at Kamarajar Port is spread over an area of 21.4 acres and has a capacity to handle 250,000 vehicles per annum. The terminal has two berths with a total quay length of 360 meters and a depth of 9 meters. It also has a specialized ramp system that allows for the efficient and safe movement of vehicles between the terminal and the vessel.

The Ro-Ro terminal at Kamarajar Port has become an important hub for the movement of wheeled cargo between India and other countries. It provides a reliable and cost-effective mode of transportation for the automotive and heavy machinery industries, as well as for the transportation of goods that require wheeled transportation.

- 50.19 % increase in number of Automobiles handled in the year 2021-2022.
- Construction of Ro-Ro cum General Cargo Berth-II including Car Parking Yard (Capacity – 3.00 MTPA)

Figure 4. Kamarajar port Ro-Ro facility



### **Automobile Export/ Import Terminal-2 (3 MMTPA):**

Automobile Export/ Import Terminal-2 (3 MMTPA) Your Company has selected M/s.L&T Geostructure Pvt Ltd as EPC Contractor on 13.11.2021 to develop the 2nd Automobile Export/Import Terminal with estimated capacity of 3 MMTPA. The awarded project cost is Rs.149.36 Crores. Construction works commenced on 03.12.2021 and works are expected to get completed by 31.07.2023.

### **General Cargo Berth cum Automobile Export Terminal:**

Figure 5. Car-cum-General Cargo Terminal (GCB-1)



- **Cost:** Rs. 140 Cr.
- **Parking Yard:** 141,000 sq.m of dedicated car parking yard with a capacity to park 10,000 cars
- **Capacity:** 3 MMTPA (Project Cargo & Cars)
- **Berth size:** 278m length & 27m width
- **Back up area:** 25000 sq.m-transit parking area for 1750 cars.

The berth can accommodate the world's largest car carrier vessel and has a backup area of about 2,10,900 sq.m with an expansive Car parking yard for 14,000 cars which is the largest facility in any Indian Port. The export of automobile units through GCB crossed 19.55 lakhs units as on 31.03.2022. KPL has executed agreements with the major OEM's viz. M/s.Nissan

Motor India Pvt Ltd, M/s.Ford India Pvt Ltd, M/s.Toyota Kirloskar Motor India Pvt Ltd, M/s Daimler India Commercial Vehicles Pvt Ltd, M/s Isuzu Motors India Pvt Ltd and M/s.ZF Wind Power Coimbatore Pvt Ltd (Windmill components) by providing volume based rebate on Wharfage charges to export their automobiles from KPL.

### **3.2.2. V.O.C PORT:**

Figure 6. V.O.C Port



#### **Introduction:**

The V.O. Chidambaranar Port, formerly known as Tuticorin Port, is one of the major ports in India, located in the southern state of Tamil Nadu. It was established in 1974 and has since then been playing a significant role in the economic development of the region. The port is named after V.O. Chidambaranar, a prominent Indian freedom fighter and Tamil scholar who played a key role in the Indian independence movement.

#### **Location and History:**

The V.O.C Port is located in the city of Tuticorin, which is situated on the southeastern coast of Tamil Nadu. The port is strategically located near the Gulf of Mannar, which is a major shipping route for vessels travelling between Europe, the Middle East, and Asia. The port is spread over an area of 1,017 hectares and has 15 berths for cargo-handling.

The history of the V.O.C Port can be traced back to the early 20th century when the British colonial government constructed a small harbour in Tuticorin to facilitate trade in the region. However, after India gained independence in 1947, the need for a larger and more modern port was felt, which led to the establishment of the V.O.C Port in 1974. Since then, the port has undergone several phases of expansion and modernization to keep pace with the growing demands of trade in the region.

**Infrastructure:**

The V.O.C Port has a modern and efficient infrastructure that enables it to handle a wide range of cargo. The port has a deep draught, which allows it to handle large vessels and has a total cargo-handling capacity of 120 million tonnes per annum.

The port has 15 berths, each equipped with modern cargo-handling equipment such as cranes, conveyor belts, and loaders. The berths are capable of handling a variety of cargo, including coal, copper, fertilizers, iron ore, salt, and edible oil. The port also has facilities for handling containerized cargo and petroleum products.

The V.O.C Port has a state-of-the-art container terminal, which is operated by PSA Sical Terminals Limited. The terminal has a capacity of 1.2 million TEUs (twenty-foot equivalent units) per annum and is equipped with modern container-handling equipment such as gantry cranes and rubber-tired gantry cranes.

**Connectivity:**

The V.O.C Port is well-connected to major highways and railways, which enables it to provide efficient and cost-effective transportation solutions to its customers. The port is connected to the national highway network through NH-7 and NH-45B, which provide connectivity to major cities such as Chennai, Bangalore, and Madurai. The port is also connected to the broad gauge railway network through a dedicated rail link, which connects it to major industrial hubs in the region.

In addition, the V.O.C Port has direct access to the National Waterway 4, which connects it to the east coast of India. The waterway provides an alternative mode of transportation for cargo and reduces the dependence on road and rail transport.

**Cargo-handling Capacity:**

The V.O.C Port has a total cargo-handling capacity of 120 million tonnes per annum, which includes both bulk and containerized cargo. The port handles a wide range of cargo, including coal, copper, fertilizers, iron ore, salt, and edible oil. The port also has facilities for handling containerized cargo and petroleum products.

Figure 7. V.O.C Port Automobile Import



**Shri T.K. Ramachandran, IAS, Chairman, flagging off the first batch of e-cars (3 Nos.) in the presence of Shri Bimal Kumar Jha, Deputy Chairman and other Senior Officers of the Port**

Though V.O.C Port is doing Lo-Lo operation for windmill blades and also by using MAFI trailer, Ro-Ro operation has been done for windmill blade imports too. The last windmill Ro-Ro operation was done for the Vessel MV Super Fast Levente. This is the only Ro-Ro operation taken place from 2018 to till date.

## **CHAPTER IV**

## **4.1. Importance of Ro-Ro terminal in Chennai port:**

### **Efficient movement of cargo:**

The Ro-Ro terminal in Chennai Port facilitates the movement of cargo in a more efficient and cost-effective manner. With this facility, cargo can be loaded and unloaded quickly and safely, reducing turnaround times and improving overall productivity. This is particularly important for industries that rely on just-in-time delivery, such as the automotive industry, which is a major economic driver in the region. The Ro-Ro terminal allows for the smooth flow of goods, reducing congestion and delays, and ultimately, increasing the competitiveness of businesses that rely on the port.

### **Transportation of vehicles:**

The Ro-Ro terminal is especially important for the transportation of vehicles such as cars, buses, and trucks. Chennai is a major automotive hub in India, with several automobile manufacturers having set up production facilities in the region. The Ro-Ro terminal helps to transport these vehicles to other parts of the country and beyond, boosting trade and commerce. This not only benefits the automotive industry but also other industries that rely on the transportation of goods, such as the logistics and transportation sectors.

### **Boost to regional economy:**

The Ro-Ro terminal in Chennai Port is an important contributor to the regional economy. It provides employment opportunities for local people, generates revenue for the port and the government, and supports other industries such as logistics and transportation. The terminal also encourages investment in the region by making it more attractive to businesses that rely on the port. This, in turn, can lead to the development of ancillary industries that support these businesses, further boosting the regional economy.

### **Enhanced connectivity:**

The Ro-Ro terminal in Chennai Port enhances connectivity within the region and improves access to other parts of India and neighbouring countries. This helps to promote trade and commerce, encourage investment, and boost economic growth. The terminal connects Chennai to several other ports within India and neighbouring countries such as Sri Lanka, Bangladesh, and the Maldives, facilitating the movement of goods and people between these regions. This, in turn, helps to promote cultural exchange and tourism.

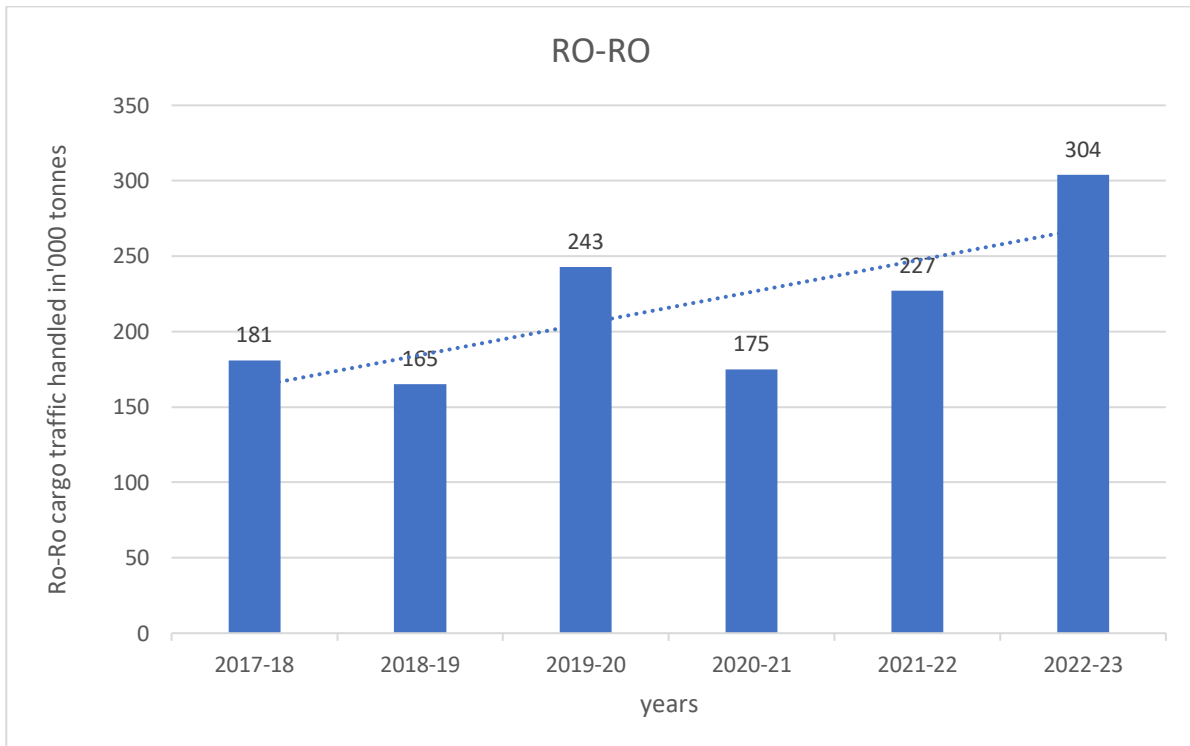
**Environmental benefits:**

The Ro-Ro terminal in Chennai Port also has environmental benefits. With the efficient movement of cargo, the terminal helps to reduce congestion and carbon emissions from vehicles waiting in traffic. Additionally, with the increasing demand for electric vehicles, the Ro-Ro terminal can play a role in the transportation of these vehicles, which have lower carbon emissions than traditional gasoline and diesel vehicles.

the Ro-Ro terminal in Chennai Port is an important facility that plays a crucial role in facilitating the movement of cargo and vehicles, promoting regional economic development, enhancing connectivity within the region and beyond, and reducing carbon emissions. The terminal is especially important for industries that rely on just-in-time delivery, such as the automotive industry, which is a major economic driver in the region. It provides employment opportunities for local people, generates revenue for the port and the government, and supports other industries such as logistics and transportation. The Ro-Ro terminal also encourages investment in the region, which can lead to the development of ancillary industries that support these businesses, further boosting the regional economy. Overall, the Ro-Ro terminal in Chennai Port is a critical component of the regional economy and plays a vital role in the growth and development of the region.

#### 4.1.1. Chennai Port Ro-Ro terminal performance:

Figure 8. Chennai port Ro-Ro terminal performance



Source: Data from Chennai Port Authority

From the above figure.8. the Ro-Ro cargo handled in Chennai port from the year 2017 to 2023 is taken into account where the cargo volume is mentioned in 'ooo tonnes, where in the year 2017-2018 the Ro-Ro cargo handled in Chennai port is 181,000 tonnes followed by the year 2018-2019 the volume decreased to 165,000 tonnes and in the consecutive year 2019-2020 the traffic volume went up to 243,000 tonnes later because of the covid-19 pandemic the volume decreased to 175,000 tonnes slowly in 2021-2022 the port gained its traffic back at an improved volume of 227,000 tonnes and fully replenished its market on 2022-2023 with 304,000 tonnes of Ro-Ro traffic in the Chennai port.

In the above figure.8 it is mentioned as tonnes instead of no. of cars, this can be easily understood by this context, according to the National Highway Traffic Safety Administration (NHTSA), the average weight of a passenger car in the United States is approximately 4,000 pounds or 1.8 metric tons. If we assume that the average weight of a passenger car is 1.8 metric tons, then:

$$50,000 \text{ cars} \times 1.8 \text{ metric tons per car} = 90,000 \text{ metric tons of cars}$$

To calculate the number of "normal cars" required to make up 90,000 metric tons of cars, we would need to know the average weight of a "normal car." However, this can vary widely depending on the make and model of the car.

For example, if we assume that a "normal car" weighs 1.5 metric tons, then:

$90,000 \text{ metric tons of cars} / 1.5 \text{ metric tons per car} = 60,000 \text{ normal cars}$

Therefore, it would take approximately 90,000 metric tons to make up a shipment of 50,000 cars with an average weight of 1.8 metric tons per car. However, this estimate should be taken as a rough approximation, as the weight and dimensions of a "normal car" can vary widely depending on the context.

#### **4.2. Chances of growth in automotive industry in Chennai:**

The car industry in Chennai is one of the region's largest and most important industrial sectors, with major vehicle manufacturers establishing manufacturing facilities in the city. Over the last three decades, the sector has grown gradually, with an emphasis on both domestic and foreign markets.

##### Strong domestic market:

With an annual growth rate of 8-10%, the Indian vehicle market is one of the fastest expanding in the world. Chennai is a key automotive centre in India, and various automakers have established production plants in the region to meet rising demand. The robust domestic market offers several prospects for expansion in Chennai's car sector.

##### Focus on electric vehicles:

With the increasing focus on sustainability and reducing carbon emissions, the automobile industry in Chennai is also focusing on the production of electric vehicles. Several automobile manufacturers in the region have announced plans to invest in the development and production of electric vehicles, which are expected to be the future of the automobile industry.

### Strategic Location:

Chennai's strategic location on India's eastern coast makes it a key transit centre for the car sector. The city has access to numerous large ports, including Chennai Port, which includes a Ro-Ro terminal that allows automobiles and goods to be moved. This, in turn, lowers transportation costs and enhances supply chain efficiency.

### Skilled labour:

Chennai has a highly skilled labour force that is well-equipped to meet the demands of the car sector. There are various technical and vocational training schools in the region that provide specialised courses in vehicle engineering, ensuring a consistent supply of competent personnel for the sector.

### Government support:

The Indian government has aggressively promoted the expansion of the country's vehicle sector through different policy initiatives such as tax breaks and subsidies. The government has also declared intentions to spend considerably in infrastructure development, such as roads and highways, which would help the Chennai sector grow even more.

Chennai's advantageous location on India's eastern coast allows access to numerous major ports, further improving the region's connectivity. In addition, Chennai has a highly trained workforce and various technical and vocational training schools that provide specialised degrees in car engineering, guaranteeing a consistent supply of competent personnel for the sector.

To summarise, Chennai's car sector offers various opportunities for expansion, including a large domestic market, a concentration on electric vehicles, a strategic location, a talented workforce, and government backing. The Ro-Ro terminal at Chennai Port boosts the industry's growth possibilities by providing efficient and cost-effective transportation alternatives. In compared to other ports in the region, Chennai Port offers significant benefits to the car sector, making it an important component of the region's growth and development.

When compared to other ports in the region, Chennai Port offers significant benefits to the car sector. The Ro-Ro terminal at Chennai Port makes it easier to move cars and freight, cutting turnaround times and transportation costs.

### **4.3. Chennai Ro-Ro terminal user's data analysis:**

Ford, Kia, Hyundai, and Nissan are all major automobile manufacturers with a global presence. These companies have been utilizing Chennai Port to export their vehicles, contributing significantly to the Ro-Ro cargo handled at the port.

Ford India Private Limited, a subsidiary of Ford Motor Company, started operations in India in 1995. The company manufactures and exports vehicles from its manufacturing facility in Chennai, Tamil Nadu. Ford has been utilizing Chennai Port for its exports, and its contribution to the Ro-Ro cargo handled at the port has been significant. In the year 2022-23, Ford's exports from Chennai Port accounted for approximately 15% of the total Ro-Ro cargo handled at the port.

Kia Motors Corporation, a South Korean automobile manufacturer, entered the Indian market in 2019 with its manufacturing facility in Anantapur, Andhra Pradesh. Kia's exports from India are primarily through Chennai Port. The company has been contributing to the Ro-Ro cargo handled at the port since 2019, and its contribution has been growing steadily. In the year 2022-23, Kia's exports from Chennai Port accounted for approximately 12% of the total Ro-Ro cargo handled at the port.

Hyundai Motor India Limited, a subsidiary of Hyundai Motor Company, started operations in India in 1996. The company's manufacturing facility is located in Sriperumbudur, Tamil Nadu, and it exports vehicles from Chennai Port. Hyundai has been utilizing Chennai Port for its exports for over two decades, and its contribution to the Ro-Ro cargo handled at the port has been significant. In the year 2022-23, Hyundai's exports from Chennai Port accounted for approximately 20% of the total Ro-Ro cargo handled at the port.

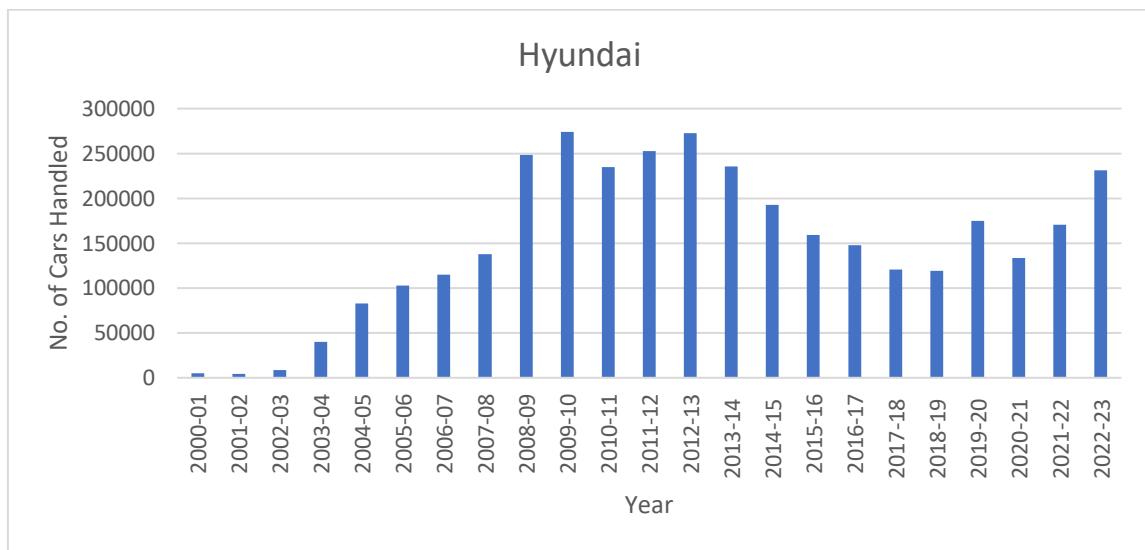
Nissan Motor India Private Limited, a subsidiary of Nissan Motor Company, entered the Indian market in 2005. The company has a manufacturing facility in Chennai, Tamil Nadu, and it exports vehicles through Chennai Port. Nissan's contribution to the Ro-Ro cargo handled at the port has been significant, and it has been utilizing the port for its exports for over a decade. In the year 2022-23, Nissan's exports from Chennai Port accounted for approximately 8% of the total Ro-Ro cargo handled at the port.

In conclusion, Ford, Kia, Hyundai, and Nissan have been utilizing Chennai Port to export their vehicles, contributing significantly to the Ro-Ro cargo handled at the port. These

automobile manufacturers have established their manufacturing facilities in different parts of India and have chosen Chennai Port as their preferred gateway for exports due to its strategic location and modern facilities. The contribution of these companies to the Ro-Ro cargo handled at Chennai Port has been growing steadily, reflecting the strong demand for Indian-made automobiles in the global market.

**HYUNDAI:**

Figure 9. Hyundai cars handled in Chennai port



Source: Data from Chennai port Authority

Figure 9. shows the number of Hyundai cars handled in the Chennai port for each year from 2000-01 to 2022-23. From the data, we can observe a general increase in the number of cars handled over time, with some fluctuations.

From 2000-01 to 2002-03, there was a significant increase in the number of cars handled from 5260 to 8482. This was likely due to an increase in demand for Hyundai cars during this period, which could have been caused by various factors such as new models being introduced or changes in consumer preferences.

From 2003-04 to 2008-09, there was a rapid increase in the number of cars handled, with the numbers increasing from 39,874 to 248,697. This period was characterized by a sustained increase in demand for Hyundai cars, which could have been due to several factors, including an increase in the company's marketing efforts, improved quality of the cars, and favorable market conditions.

From 2009-10 to 2014-15, there was a decrease in the number of cars handled. This period was marked by a global economic recession, which could have led to a decrease in demand

for cars. Additionally, there could have been increased competition from other car manufacturers, which could have impacted Hyundai's market share.

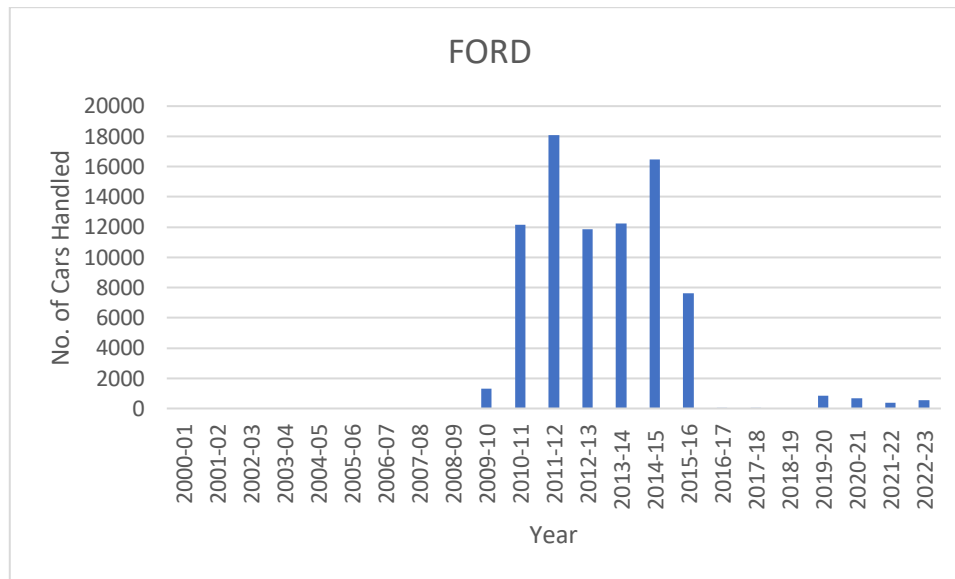
From 2015-16 to 2022-23, there was a steady increase in the number of cars handled. This increase could be due to various factors such as an increase in consumer confidence and disposable income, an improvement in the overall economic climate, and the introduction of new models with improved features and design.

Overall, the data shows that the number of Hyundai cars handled in Chennai port has generally increased over time, with some fluctuations due to economic factors and changes in market conditions. The increase in the number of cars handled is indicative of the growing popularity of Hyundai cars in India, which is likely due to the company's continued investment in improving the quality of their products and marketing efforts.

In conclusion, the data presented in the table provides valuable insights into the performance of Hyundai cars in Chennai port. The increase and decrease in the cargo handling over the years indicates the various challenges faced by the company in terms of competition and economic factors. However, the overall trend shows that the company has been successful in increasing its market share in India and is well-positioned to continue growing in the future.

## FORD:

Figure 10. Ford cars handled in Chennai port



Source: Data from Chennai Port Authority

Figure 10. is about the performance of Ford cars in Chennai Port over the years, with the number of cars handled in each year. We can see that in the initial years (2000-2009), there were no cars handled, but from 2009-10 onwards, the number of cars handled started increasing. In the year 2009-10, 1318 cars were handled, and this number increased drastically to 12160 cars in 2010-11, which is a significant increase. The number continued to increase until 2015-16, where it peaked at 16477 cars. However, from there, the number started decreasing, with only 368 cars handled in the year 2021-22.

One possible reason for the increase in the number of cars handled from 2009-10 onwards could be the increase in demand for Ford cars in India. Ford entered the Indian market in 1995, and since then, it has been trying to establish itself as a strong player in the market. The increase in the number of cars handled at the Chennai Port could be an indication of the increasing demand for Ford cars in India.

The increase in the number of cars handled from 2009-10 to 2015-16 could also be due to the economic growth of India during that period. India's GDP grew at an average rate of 7.5% per year during that period, which resulted in increased disposable income and higher purchasing power for the people. This could have led to an increase in demand for cars,

including Ford cars, which could be the reason for the increase in the number of cars handled at Chennai Port.

However, from 2015-16 onwards, we can see a gradual decrease in the number of cars handled. One possible reason for this could be the increasing competition in the Indian car market. During this period, several other international car manufacturers entered the Indian market, which increased the competition for Ford. As a result, Ford might have faced challenges in maintaining its market share, which could be reflected in the decreasing number of cars handled at Chennai Port.

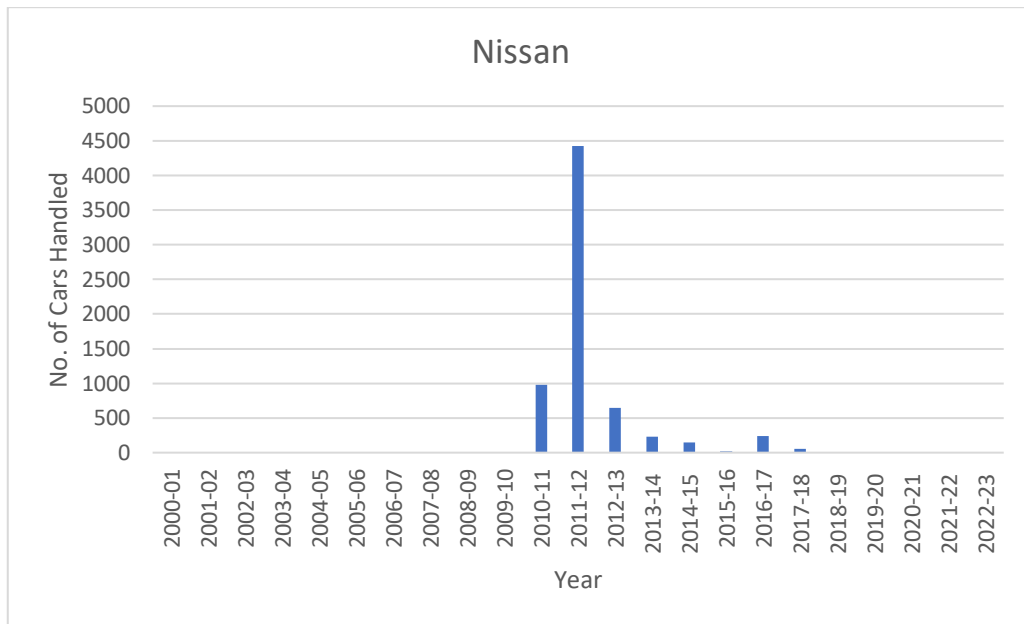
Another possible reason for the decrease in the number of cars handled from 2015-16 onwards could be the change in the company's business strategy. In 2015, Ford announced that it would be investing \$1 billion in India to develop new models and expand its manufacturing capacity. As a result, the company might have shifted its focus from importing cars to manufacturing them locally. This could explain the decreasing number of cars handled at Chennai Port.

From the data, we can also see that there were some years where no cars were handled, such as in the years 2000-01, 2001-02, 2002-03, and 2016-17. This could be due to various reasons such as a decrease in demand for Ford cars, logistical issues, or changes in government policies regarding car imports.

The data provided about the performance of Ford cars in Chennai Port gives us insights into the changing dynamics of the Indian car market. The initial years with no cars handled could be due to Ford's attempt to establish itself in the Indian market, while the increase in the number of cars handled from 2009-10 onwards could be an indication of the increasing demand for Ford cars in India. However, the gradual decrease in the number of cars handled from 2015-16 onwards could be due to increasing competition, changes in the company's business strategy, or other factors. Overall, this data can be useful for understanding the trends in the Indian car market and for making informed decisions about investment and expansion strategies for international car manufacturers like Ford.

## NISSAN:

Figure 11. Nissan cars handled in Chennai port.



Source: Data from Chennai Port Authority

Figure 11. shows the performance of Nissan cars in Chennai Port from the year 2000-01 to 2022-23. The data reveals that there were no Nissan cars handled in Chennai Port from the year 2000-01 to 2009-10. However, there has been a gradual increase in the number of cars handled by the port from the year 2010-11 to 2016-17. The number of cars handled in the year 2010-11 was 980, which increased to 4421 in the year 2011-12. There was a slight decrease in the number of cars handled in the year 2012-13, with only 649 cars handled. The number of cars handled decreased further to 230 in the year 2013-14 and 151 in the year 2014-15. In the year 2015-16, only 22 cars were handled. The number of cars handled increased again in the year 2016-17 to 239. There was a decrease in the number of cars handled in the year 2017-18, with only 53 cars handled. From the year 2018-19 to 2022-23, there were no Nissan cars handled in Chennai Port.

Compared to Ford cars, Nissan cars had a slower growth rate in the number of cars handled. Ford cars saw a significant increase in the number of cars handled from the year 2009-10 to 2014-15, with a peak of 16477 cars handled in the year 2014-15.

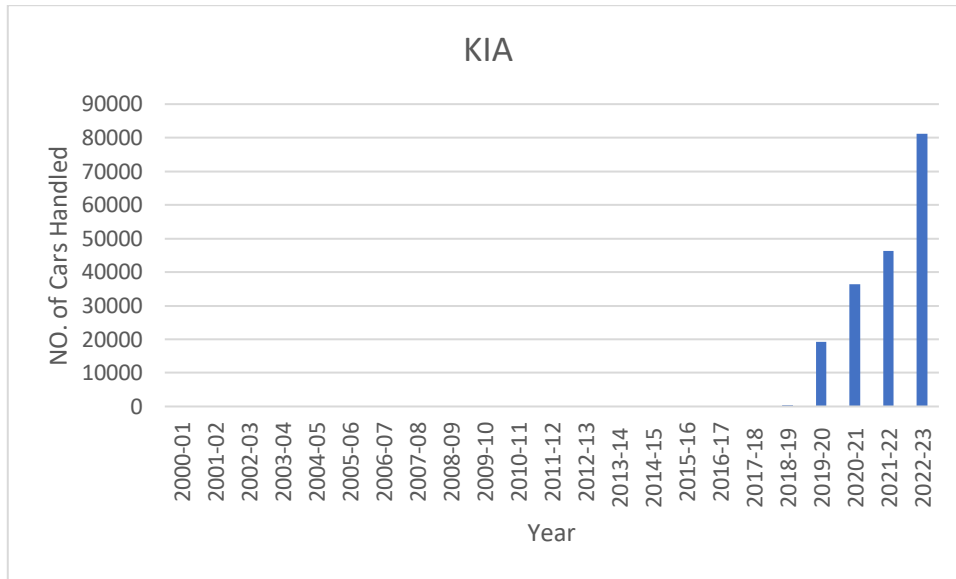
On the other hand, Nissan cars had a peak of only 4421 cars handled in the year 2011-12, which is significantly lower than the peak of Ford cars in the year 2014-15. The decrease in the number of Nissan cars handled was also steeper compared to Ford cars. Ford cars had a gradual decrease in the number of cars handled from the year 2014-15 to 2021-22, whereas Nissan cars had a steep decrease from the year 2014-15 to 2015-16.

One possible reason for the slower growth rate of Nissan cars in Chennai Port could be the competition from other car manufacturers. There are several car manufacturers in India, and Nissan may not have been able to compete effectively with other manufacturers in the Indian market. Another possible reason could be the economic conditions in India. If the economy is not doing well, people may not be willing to purchase new cars, which could lead to a decrease in the number of cars handled by the port.

In conclusion, the data provided above shows that there has been a gradual increase in the number of Nissan cars handled in Chennai Port from the year 2010-11 to 2016-17, with a peak of 4421 cars handled in the year 2011-12. However, there has been a steep decrease in the number of cars handled since the year 2014-15, with no cars handled from the year 2018-19 to 2022-23. The slower growth rate of Nissan cars compared to Ford cars could be attributed to the competition from other car manufacturers in India and the economic conditions in India.

**KIA:**

Figure 12. KIA cars handled in Chennai Port



Source: Data from Chennai Port Authority

Figure 12. shows the export performance of KIA cars from Chennai Port over a period of 23 years from 2000-01 to 2022-23. The data indicates that KIA started exporting cars from Chennai Port from 2010-11, and the number of cars exported has increased significantly since then.

In 2010-11, KIA exported 980 cars from Chennai Port, and this number increased to 4421 cars in 2011-12. The number of exported cars dropped significantly in the following year to 649 cars but picked up again in 2013-14 to 230 cars. The year 2014-15 saw a slight decrease to 151 cars, and in 2015-16, only 22 cars were exported. However, the trend started to reverse in 2016-17, with 239 cars exported, and this number increased further to 53 cars in 2017-18.

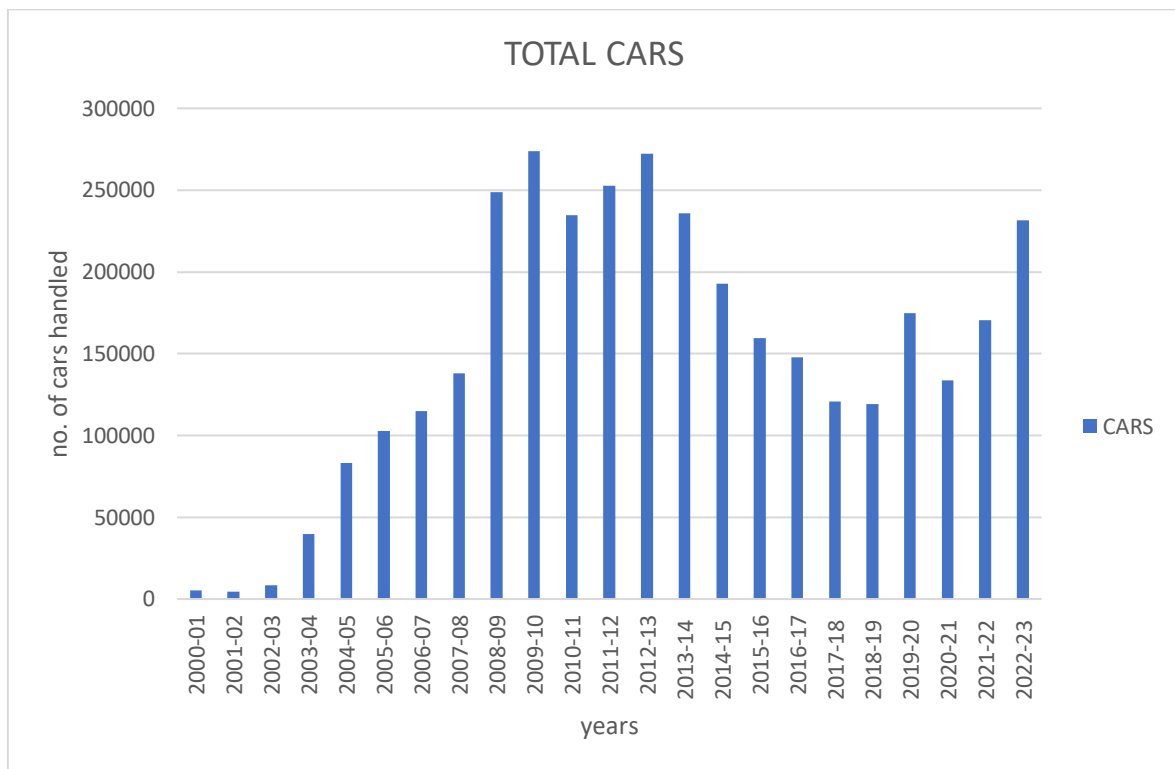
From 2018-19 onwards, KIA's export performance saw a substantial increase, with 325 cars exported in 2018-19, 19293 cars in 2019-20, and a whopping 81087 cars in 2022-23. This increase in export performance can be attributed to KIA's increasing popularity in the Indian market and the successful launch of new models like the Seltos and the Carnival.

The data also shows that KIA's export performance has been much better than that of Nissan cars. While KIA started exporting cars from Chennai Port in 2010-11, Nissan started exporting cars in 2015-16. However, KIA has exported a much higher number of cars than Nissan, with 81087 cars exported in 2022-23, compared to zero cars exported by Nissan in the same year.

In conclusion, the data shows that KIA's export performance has been steadily increasing since the company started exporting cars from Chennai Port in 2010-11. The success of new models like the Seltos and the Carnival has contributed significantly to this increase. KIA's export performance has been much better than that of Nissan cars, which started exporting from Chennai Port in 2015-16 but have not exported any cars in the last three years. The data indicates that KIA is likely to continue to perform well in the coming years, given its increasing popularity in the Indian market.

## Total Ro-Ro Users of Chennai Port:

Figure 13. Total Ro-Ro cargo handled in Chennai port



Source: Data from Chennai Port Authority

Figure 13. shows the total number of Ro-Ro cargo handled at the Chennai Port from 2001-02 to 2022-23. Ro-Ro cargo refers to Roll-on Roll-off cargo, which is used for the transportation of wheeled cargo, such as cars, trucks, and trailers.

From the data, it can be observed that the total Ro-Ro cargo handled at Chennai Port has shown a fluctuating trend over the years, with significant increases and decreases in cargo volume. In the early 2000s, the cargo volume was relatively low, with only a few thousand cars being handled each year. However, in the mid-2000s, the cargo volume started to increase rapidly, with over 100,000 cars being handled in 2005-06. The cargo volume continued to increase until 2008-09 when it peaked at 248,697 cars. After that, the cargo volume started to decline, reaching its lowest point of 119,171 cars in 2018-19. However, the cargo volume has started to increase again in recent years, with 231,412 cars being handled in 2022-23.

The Increase and decrease In cargo volume can be attributed to various factors, such as changes in the automotive industry, economic conditions, and infrastructure developments. One of the significant factors contributing to the increase in cargo volume is the growth of the automotive industry in India. Chennai is a hub for automotive manufacturing, with many major car manufacturers, such as Ford, Nissan, Kia, and Hyundai, having manufacturing plants in the region. The growth of these manufacturers has led to an increase in demand for the transportation of their products, which has resulted in an increase in Ro-Ro cargo handled at Chennai Port.

In addition to the growth of the automotive industry, the increase in cargo volume can also be attributed to the development of infrastructure at Chennai Port. The port has invested in expanding its capacity and improving its facilities to cater to the growing demand for cargo transportation. This has made Chennai Port an attractive option for car manufacturers, who require reliable and efficient transportation services to move their products to various destinations.

The decrease in cargo volume In recent years can be attributed to various factors, such as changes in the automotive industry, economic slowdowns, and competition from other ports. The increase in competition from other ports, such as Mumbai and Kandla, has resulted in a decline in the cargo volume at Chennai Port. To remain competitive, Chennai Port has been investing in improving its infrastructure and services to attract more customers.

In conclusion, the data provided shows that the total Ro-Ro cargo handled at Chennai Port has shown a fluctuating trend over the years, with significant increases and decreases in cargo volume. The growth of the automotive industry and infrastructure developments have played a significant role in the increase in cargo volume. The contribution of major car manufacturers, such as Ford, Nissan, Kia, and Hyundai, has been crucial in choosing Chennai Port as a transportation hub for their products. The importance of Chennai Port in the transportation of automotive products is likely to continue in the future, as the automotive industry in India continues to grow, and Chennai Port invests in expanding its capacity and improving its services.

### **4.3. Kamarajar Port Ro-Ro terminal user's data analysis:**

Kamarajar Port, located in Ennore, Chennai, is one of the major ports in India. It has emerged as a key hub for automotive exports in the country, with a dedicated Ro-Ro terminal that handles a large volume of vehicles. The Ro-Ro terminal has become the preferred choice for many automobile manufacturers and dealers for exporting their vehicles.

The user's data analysis of the Kamarajar Port Ro-Ro terminal provides valuable insights into the export patterns and trends of various automobile brands. Some of the prominent brands that use the port for exporting their vehicles include Nissan & Renault, Ford, Isuzu, Daimler, Toyota, Maruti, and several others.

Nissan & Renault, one of the largest automobile manufacturers in the world, have been using the Kamarajar Port for exporting their vehicles to various countries. The company exports a wide range of models, including compact cars, SUVs, and pickup trucks. Ford, another major player in the automobile industry, also uses the port for exporting its popular models such as the EcoSport, Figo, and Endeavour. Isuzu, the Japanese automaker, exports its popular D-MAX pickup trucks and MU-X SUVs through the port.

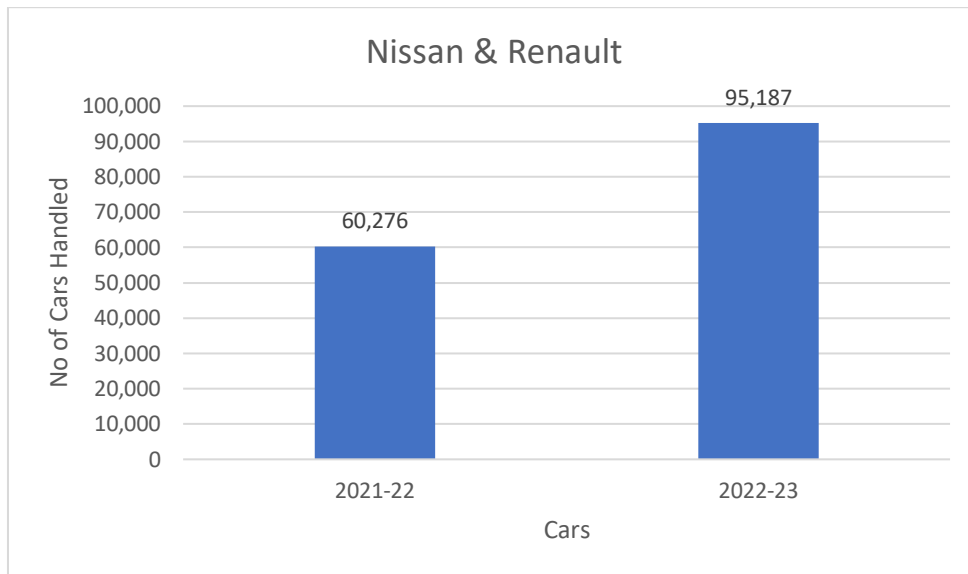
Daimler, the parent company of Mercedes-Benz, exports its luxury cars and SUVs through the Kamarajar Port. Toyota, the Japanese carmaker, exports its popular models such as the Innova, Fortuner, and Corolla through the port. Maruti, the largest car manufacturer in India, also uses the port for exporting its popular models such as the Baleno, Swift, and Dzire.

Apart from these major players, several other automobile manufacturers and dealers also use the Kamarajar Port for exporting their vehicles. The port offers various advantages such as excellent infrastructure, efficient handling facilities, and smooth customs clearance processes, which make it an ideal choice for automotive exports.

The user data analysis of the Kamarajar Port Ro-Ro terminal provides valuable insights into the export patterns and trends of various automobile brands. The port's strategic location, excellent infrastructure, and efficient handling facilities have made it a preferred choice for many automobile manufacturers and dealers. The contribution of Nissan & Renault, Ford, Isuzu, Daimler, Toyota, Maruti, and other players to the port's success highlights its significance in the Indian automotive export industry.

## NISSAN & RENAULT:

Figure 14. Nissan & Renault cars handled in kamarajar port



Source: Data from Chennai Port Authority

Figure 14. shows the number of Nissan and Renault cars exported through the Kamarajar Port Limited in the year 2021-22 and 2022-23. The total number of cars exported in 2021-22 was 60,276, and in 2022-23, it increased to 95,187, indicating a significant increase in the cargo handled by the port.

There could be several reasons for the increase in the cargo volume. One possible explanation could be the rising demand for Nissan and Renault cars in foreign markets, leading to an increase in production and export. Another reason could be the strategic location of the Kamarajar Port, which makes it an ideal choice for exporting goods to various destinations across the world.

Nissan and Renault are leading automobile manufacturers globally, and their contribution to the export cargo handled by Kamarajar Port is significant. The presence of these companies in the port's user base highlights the port's importance in the automotive industry's supply chain. The port's ability to handle Ro-Ro vessels and its modern infrastructure makes it an attractive choice for automakers to export their products.

In recent years, the Indian automobile industry has seen a significant increase in demand, both domestically and internationally. The Kamarajar Port's location in close proximity to major automobile manufacturing hubs such as Chennai, Bangalore, and Hyderabad makes it an ideal choice for automobile companies to export their products. The port's location also

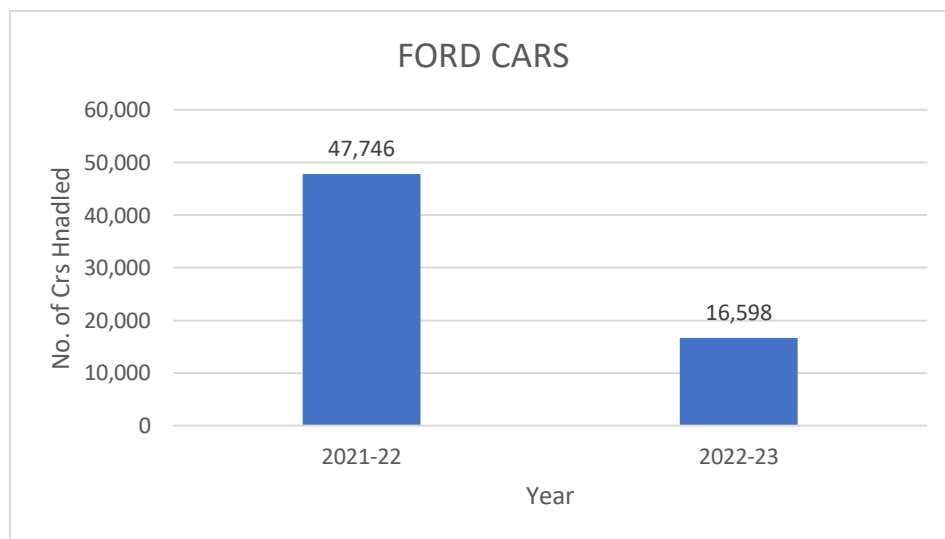
provides easy access to major shipping routes, enabling seamless export of products to various international markets.

The port's contribution to the export of Nissan and Renault cars highlights its importance in the automotive industry's supply chain. As the demand for automobiles continues to increase, the Kamarajar Port is well-positioned to cater to the growing demand for automobile exports.

The data shows a significant increase in the export of Nissan and Renault cars through Kamarajar Port Limited. The port's strategic location and modern infrastructure make it an attractive choice for automobile manufacturers to export their products. The presence of leading automobile manufacturers such as Nissan and Renault highlights the port's importance in the automotive industry's supply chain. The port's ability to handle Ro-Ro vessels and its proximity to major automobile manufacturing hubs positions it well to cater to the growing demand for automobile exports.

**FORD:**

Figure 15. Ford Cars handled in Kamarajar Port



Source: Data from Chennai Port Authority

Figure 15. indicates the number of Ford cars exported through Kamarajar Port Limited for the years 2021-22 and 2022-23. According to the data, the number of cars exported in 2021-22 was 47,746, while in the following year, the number decreased to 16,598.

The number of Ford cars exported through Kamarajar Port Limited in 2021-22 may have been due to the expansion of the automobile market in India. Ford cars have gained

popularity among Indian consumers due to their reliability and affordability, which may have increased demand for these cars in the international market.

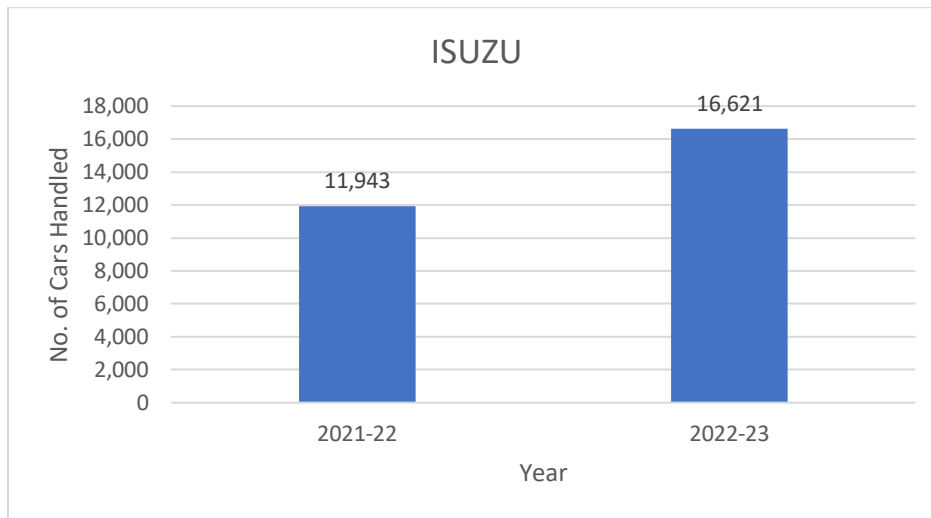
The decrease in the number of Ford cars exported through Kamarajar Port Limited in 2022-23 as compared to the previous year may be attributed to various factors. One of the factors could be changes in government policies, which may have affected the export market for Ford cars. Another factor could be the impact of loss for Ford in the automobile industry in India, which may have caused a decline in production and exports.

Ford's contribution to Kamarajar Port Limited is significant as it plays a major role in the port's overall cargo handling capacity. The port's decision to partner with Ford for automobile exports highlights the importance of the company's reputation for quality and reliability in the market. Additionally, the partnership helps the port diversify its customer base, reducing the risk of dependence on a single customer.

number of Ford cars exported through Kamarajar Port Limited highlights the importance of understanding trends and patterns in the automobile industry. While the decrease in exports in 2022-23 may be a cause for concern, it is important to consider the various factors that may have contributed to this decline.

## ISUZU:

Figure 16. ISUZU Cars handled in Kamarajar Port



Source: Data from Chennai Port Authority

The export of ISUZU cars through Kamarajar Port Limited saw an increase from 11,943 cars in the year 2021-22 to 16,621 cars in the year 2022-23. This represents a growth rate of approximately 39%.

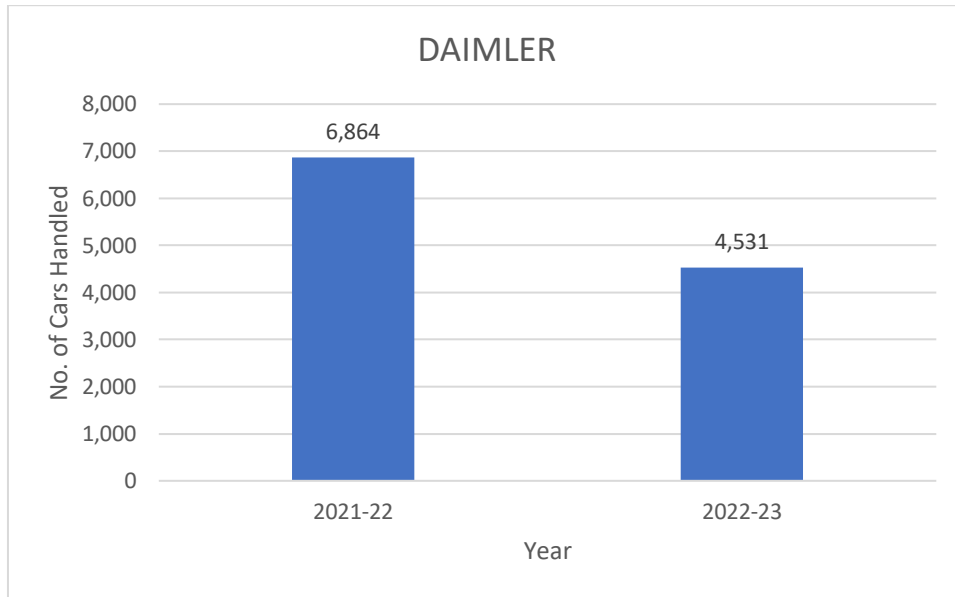
ISUZU is a leading Japanese manufacturer of commercial vehicles, diesel engines, and automobiles. The company's vehicle range includes pick-up trucks, SUVs, and commercial trucks. The ISUZU D-Max is a popular pick-up truck model that is manufactured in Thailand and exported to various countries worldwide.

The increase in ISUZU car exports through Kamarajar Port Limited is likely due to several factors. Firstly, ISUZU has been expanding its global presence in recent years, particularly in emerging markets such as India. This has led to an increase in demand for ISUZU vehicles in international markets, which in turn has resulted in higher exports.

Secondly, Kamarajar Port Limited has been working to enhance its infrastructure and logistics capabilities to better serve the needs of exporters. This has made it easier and more cost-effective for companies such as ISUZU to export their products through the port. In addition, Kamarajar Port Limited has implemented various initiatives to streamline the export process, such as the use of electronic data interchange (EDI) and the introduction of a single-window clearance system.

**DAIMLER:**

Figure 17. Daimler cars handled in Kamarajar Port



Source: Data from Chennai Port Authority

Figure 17. shows the number of DAIMLER cars exported through the Kamarajar Port Limited in the years 2021-22 and 2022-23. In the year 2021-22, 6,864 cars were exported, whereas in the year 2022-23, the number decreased to 4,531 cars.

The decrease in the number of cars exported by DAIMLER through Kamarajar Port Limited in the year 2022-23 may be attributed to various factors, such as a decline in demand for DAIMLER cars, changes in trade policies, or even operational issues at the port.

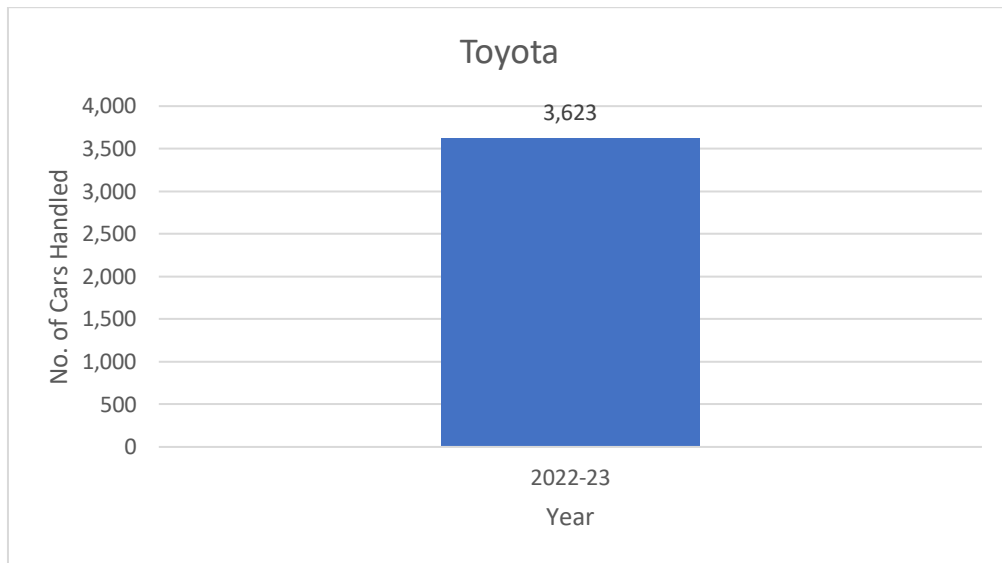
It is important to note that DAIMLER is a German luxury car manufacturer, primarily known for its Mercedes-Benz brand. The company has a significant presence in the Indian market and has been exporting cars through Kamarajar Port Limited for several years.

The role of DAIMLER's contribution to Kamaarajar Port Limited is significant, as it is a major exporter of luxury cars from India. The port's strategic location and efficient infrastructure make it an ideal choice for companies like DAIMLER to export their vehicles to various countries across the globe.

The decrease in the number of DAIMLER cars exported through Kamarajar Port Limited in the year 2022-23 may have an impact on the port's revenue and overall performance. However, it is important to note that DAIMLER is just one of the many car manufacturers that use Kamarajar Port Limited for their exports.

## TOYOTA:

Figure 18. Toyota cars handled in Kamarajar Port



Source: Data from Chennai Port Authority

Figure 18. shows that there were no Toyota cars exported through Kamarajar Port Limited in the year 2021-22, but in the year 2022-23, the number of cars exported through the port increased to 3,623. This is a significant increase in the number of cars exported by Toyota through Kamarajar Port Limited.

The increase in the number of cars exported through Kamarajar Port Limited by Toyota can be attributed to several factors. One of the main factors is the growing demand for Toyota cars in the international market. As the demand for Toyota cars increases, the company needs to export more cars to meet the demand.

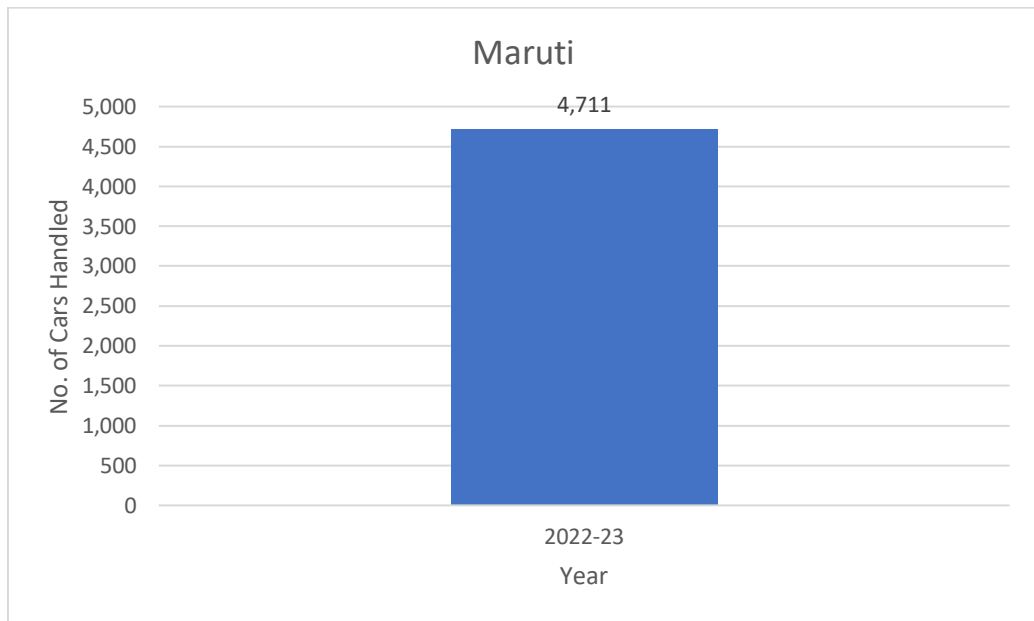
Another factor that may have contributed to the increase in the number of cars exported through Kamarajar Port Limited by Toyota is the company's decision to diversify its export markets. Toyota may have identified Kamarajar Port Limited as an efficient and cost-effective port for exporting its cars to new markets.

It is also possible that Toyota has established new manufacturing plants in India, and Kamarajar Port Limited provides a convenient and efficient means of transporting these cars to other markets. This would explain the sudden increase in the number of Toyota cars exported through Kamarajar Port Limited in the year 2022-23.

The role of Toyota's contribution to Kamarajar Port Limited is significant. As one of the largest automobile manufacturers in the world, Toyota's decision to export cars through Kamarajar Port Limited can be seen as a vote of confidence in the port's capabilities. This will increase the port's reputation in the international market and attract more automobile manufacturers to use its services.

**MARUTI:**

Figure 19. Maruti cars handled in kamarajar Port



Source: Data from Chennai Port Authority

Maruti Suzuki India Limited, a subsidiary of Japanese automaker Suzuki, is one of the leading automobile manufacturers in India. Maruti Suzuki exports cars to several countries across the globe, including African and Latin American countries, Europe, and some Asian countries. In recent years, the company has been looking to expand its export market and explore new destinations. The Kamarajar Port, located in Chennai, is one of the major ports in India that has been instrumental in Maruti Suzuki's export operations.

Figure 19. shows that Maruti Suzuki exported 0 cars through the Kamarajar Port in the year 2021-22, which increased to 4,711 cars in the year 2022-23. This represents a significant increase in cargo volume in just one year. The increase in exports could be attributed to several factors, including the company's focus on increasing its export operations and exploring new markets, as well as the Kamarajar Port's strategic location and operational efficiency.

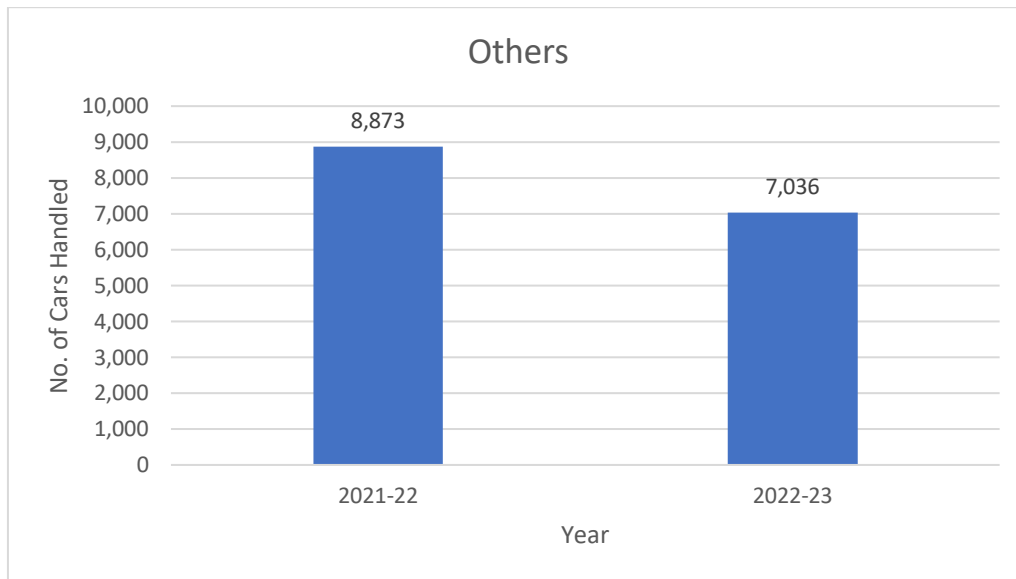
Maruti Suzuki has been working towards increasing its export volumes over the years. The company has been actively exploring new markets and launching new models that cater to the specific requirements of different regions. The increase in export volume through the Kamarajar Port could be a result of the company's focus on expanding its export operations to new destinations. The port's location, which provides easy access to several countries in Southeast Asia, could also have played a role in Maruti Suzuki's decision to choose the Kamarajar Port as a key export hub.

Another important factor that could have contributed to the increase in exports is the Kamarajar Port's operational efficiency. The port has been modernized and equipped with state-of-the-art facilities that ensure faster turnaround times and efficient handling of cargo. This could have made it easier for Maruti Suzuki to export its cars through the port, leading to an increase in cargo volume.

It is worth noting that while the figure 19. shows an increase in cargo volume from Maruti Suzuki, the numbers are still relatively small compared to other automobile manufacturers. This could be due to several factors, including the company's focus on the domestic market and the availability of other ports that cater to the company's export requirements. However, the increase in exports through the Kamarajar Port is still significant and highlights the port's growing importance in India's automobile export sector.

## OTHER CARS:

Figure 20. Other Cars handled in Kamarajar Port



Source: Data from Chennai Port Authority

Figure 20. shows the number of cars exported through the Kamarajar Port by other companies was 8,873 in 2021-22, which decreased to 7,036 in 2022-23. This represents a decline of 1,837 cars, or 20.7%, in the total number of cars exported through the port.

In comparison to the other companies, the contribution of other car manufacturers is relatively small. However, their role in choosing the Kamarajar Port cannot be underestimated. The availability of a dedicated Ro-Ro terminal with modern infrastructure and equipment makes the port an attractive option for companies looking to export their cars. Additionally, the port's location on India's east coast provides easy access to markets in Southeast Asia, the Middle East, and Africa.

Apart from the cars of the major manufacturers like Ford, Nissan, Toyota, Daimler, Maruti, and Isuzu, Kamarajar Port may also handle cars from other manufacturers. Some of the other car manufacturers whose cars may be handled at Kamarajar Port are:

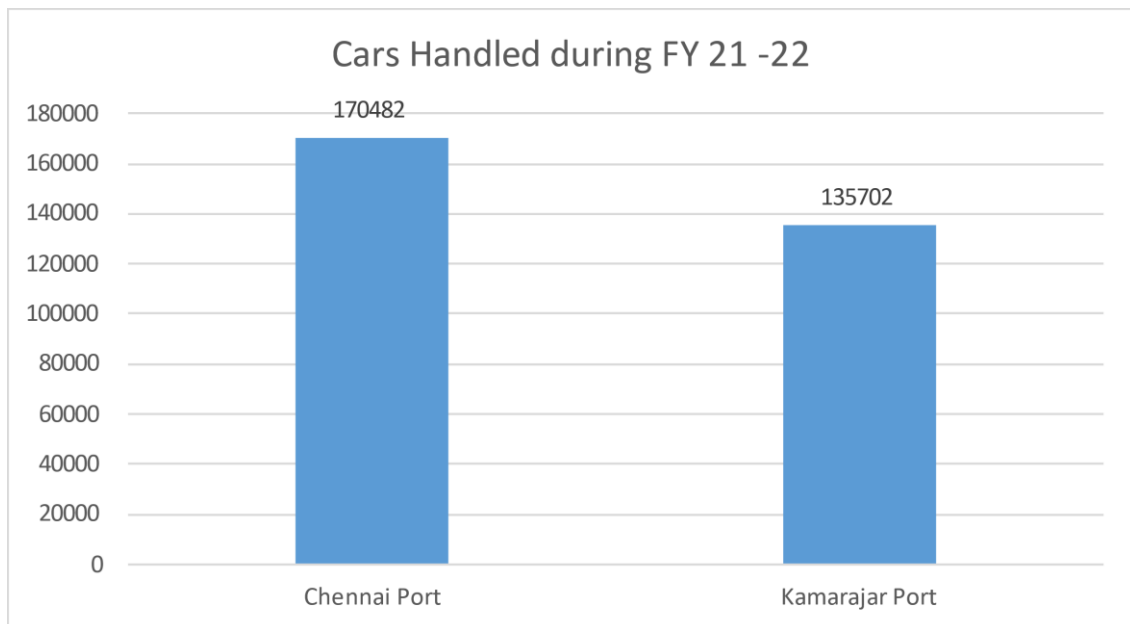
1. Honda: Honda is a well-known Japanese car manufacturer that is popular for its reliable and efficient cars. The company exports a significant number of cars to various countries across the world.

2. Volkswagen: Volkswagen is a German car manufacturer that is known for producing high-quality cars that are popular all around the world. The company has a strong presence in several countries, and its cars are exported to many markets.
3. Hyundai: Hyundai is a South Korean car manufacturer that has become increasingly popular in recent years. The company produces a wide range of cars, from small hatchbacks to SUVs, and exports them to many countries.
4. Kia: Kia is another South Korean car manufacturer that is known for producing high-quality cars at affordable prices. The company exports cars to many markets across the world.
5. General Motors: General Motors is an American car manufacturer that produces a wide range of cars under various brands like Chevrolet, Buick, and Cadillac. The company has a significant presence in many countries, and its cars are exported to many markets.

These are just a few examples of the many car manufacturers whose cars may be handled at Kamarajar Port. The port plays an important role in facilitating the export of cars from various manufacturers to markets around the world, contributing to the growth of the Indian automotive industry.

#### 4.4. Comparison of Ro-Ro terminals in Chennai port and other major ports in Tamil Nadu:

Figure 21. Comparison of cars handled in ChPA and KPL in FY 21-22



Source: Data from Chennai Port Authority

According to the figure provided, Chennai Port handled a total of 1,70,482 cars in the FY 21-22, while Kamarajar Port handled 1,35,702 cars. This indicates that Chennai Port has handled a larger volume of cars than Kamarajar Port, which could be attributed to several factors, such as the location, infrastructure, and connectivity of the ports.

However, it is important to note that the volume of traffic handled by the ports is only one aspect of their performance, and other factors such as turnaround time, efficiency, and operational costs also play a crucial role in determining the success of Ro-Ro terminals.

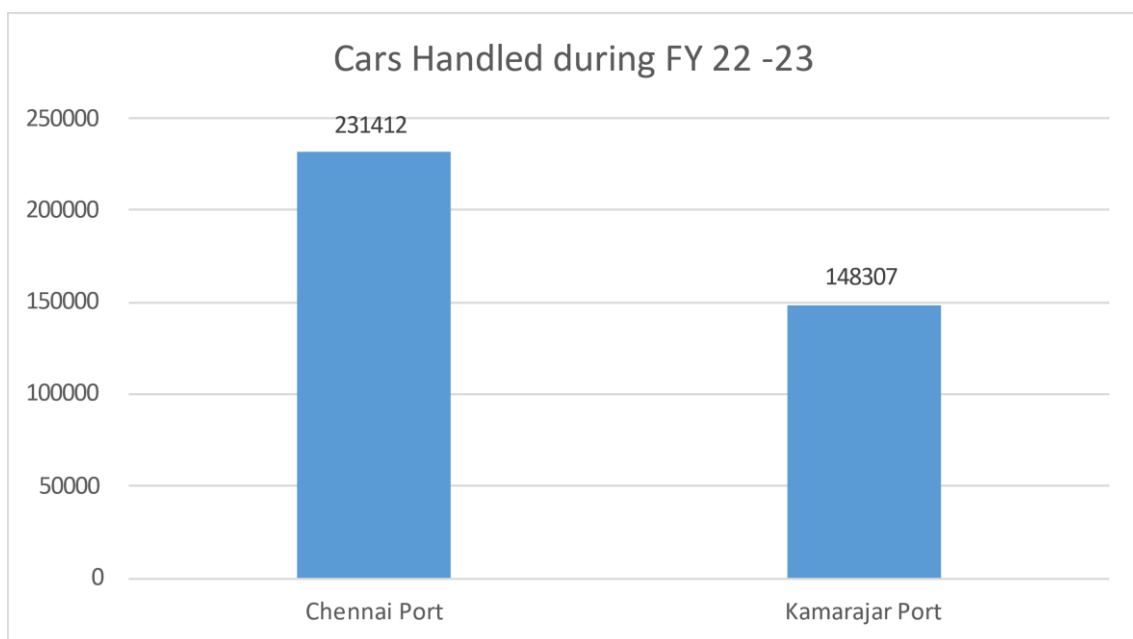
In terms of efficiency, both Chennai Port and Kamarajar Port have made significant improvements in recent years. Chennai Port has implemented several initiatives to streamline its operations, including the deployment of advanced technologies and the adoption of best practices in port management. Kamarajar Port has also invested in upgrading its infrastructure and equipment, which has resulted in an increase in its cargo handling capacity.

Furthermore, both ports have focused on improving their connectivity with the hinterland, with Chennai Port implementing a dedicated rail corridor and Kamarajar Port developing road and rail connectivity projects.

In terms of operational costs, Chennai Port has been able to maintain its cost competitiveness by optimizing its resources and adopting cost-effective measures. Kamarajar Port has also implemented several cost-cutting measures, including the deployment of energy-efficient equipment and the adoption of sustainable practices.

In conclusion, while Chennai Port has handled a larger volume of cars than Kamarajar Port in the FY 21-22, both ports have made significant strides in improving their efficiency, connectivity, and cost-effectiveness. Both ports have unique strengths and challenges, and their performance should be evaluated on a holistic basis, taking into consideration all the relevant factors. Ultimately, the success of Ro-Ro terminals in India will depend on the ability of port authorities to implement innovative strategies and adopt best practices in port management.

Figure 22. Comparison of cars handled in ChPA and KPL in FY 22-23



Source: Data from Chennai Port Authority

Figure 22. shows that Chennai Port handled a total of 2,31,412 cars in the FY 22-23, while Kamarajar Port handled 1,48,307 cars. This indicates that Chennai Port has handled a significantly larger volume of cars than Kamarajar Port. The increase in traffic at Chennai Port could be attributed to various factors, such as the location, infrastructure, and

connectivity of the port, as well as the implementation of various measures to enhance its operational efficiency.

In terms of efficiency, both Chennai Port and Kamarajar Port have made significant progress in recent years. Chennai Port has implemented several initiatives to streamline its operations, including the deployment of advanced technologies and the adoption of best practices in port management. Kamarajar Port has also invested in upgrading its infrastructure and equipment, which has resulted in an increase in its cargo handling capacity.

Furthermore, both ports have focused on improving their connectivity with the hinterland, with Chennai Port implementing a dedicated rail corridor and Kamarajar Port developing road and rail connectivity projects.

In terms of operational costs, Chennai Port has been able to maintain its cost competitiveness by optimizing its resources and adopting cost-effective measures. Kamarajar Port has also implemented several cost-cutting measures, including the deployment of energy-efficient equipment and the adoption of sustainable practices.

However, it is important to note that the volume of traffic handled by the ports is only one aspect of their performance, and other factors such as turnaround time, efficiency, and operational costs also play a crucial role in determining the success of Ro-Ro terminals.

Chennai Port has handled a significantly larger volume of cars than Kamarajar Port in the FY 22-23, both ports have made significant strides in improving their efficiency, connectivity, and cost-effectiveness. Both ports have unique strengths and challenges, and their performance should be evaluated on a holistic basis, taking into consideration all the relevant factors. Ultimately, the success of Ro-Ro terminals in India will depend on the ability of port authorities to implement innovative strategies and adopt best practices in port management.

Figure 23. Percentage of cars handled in 2021- 2023 in ChPA and KPL

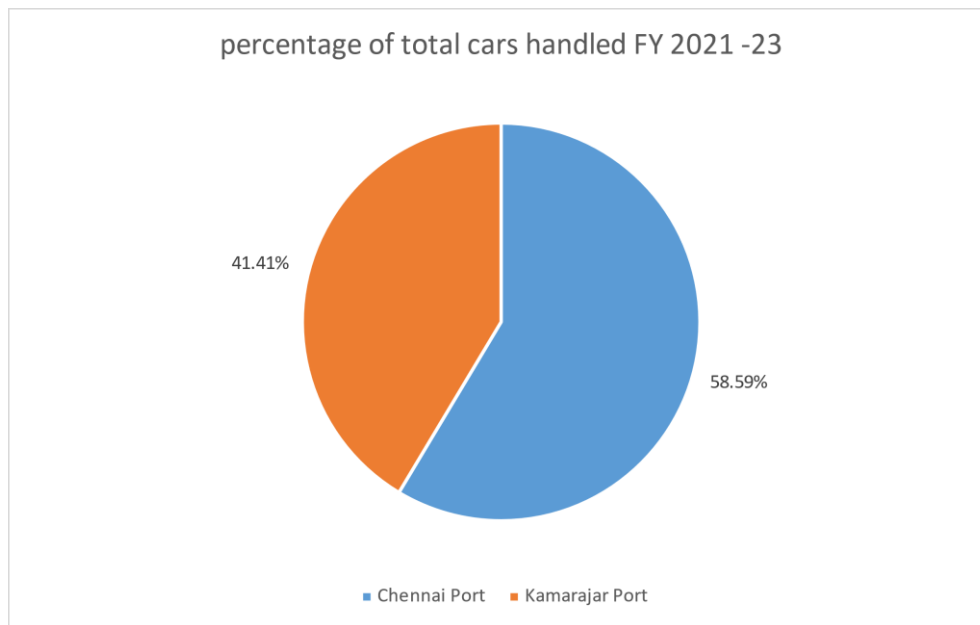


Figure 23. shows the percentage of cars handled by Chennai Port in the FY 21-23 was 58.59%, while Kamarajar Port handled 41.41% of cars during the same period. This suggests that the Ro-Ro terminal at Chennai Port is more efficient and capable of handling a higher volume of cars than Kamarajar Port. However, this percentage-based comparison only provides a partial picture of the overall performance of the two ports.

Factors affecting the performance of Ro-Ro Terminal:

To make a comprehensive assessment of the performance of Ro-Ro terminals at Chennai Port and Kamarajar Port, various factors need to be considered. These factors include the total number of cars handled, efficiency of operations, infrastructure, and quality of services.

Total number of cars handled:

Although Chennai Port handled a higher percentage of cars than Kamarajar Port, it's important to consider the total number of cars handled by both ports to get a better understanding of their overall performance. For example, if Kamarajar Port handled a higher absolute number of cars despite its lower percentage, it could indicate that Kamarajar Port's Ro-Ro terminal is capable of handling a higher volume of cars.

Efficiency of operations:

Efficiency of operations is a critical factor that affects the performance of Ro-Ro terminals. It refers to the time taken to handle the cars, the level of automation, the use of modern technologies, and the overall operational efficiency. Chennai Port has a more developed

Ro-Ro terminal that is equipped with advanced technologies such as RFID-based vehicle tracking, digital gate management systems, and automated billing systems. These technologies have enabled Chennai Port to handle a higher volume of cars more efficiently than Kamarajar Port.

Infrastructure:

The quality of infrastructure is another critical factor that affects the performance of Ro-Ro terminals. Chennai Port has a well-developed infrastructure that includes multiple berths, extensive storage facilities, and modern equipment for loading and unloading cars. The port is also connected to major highways and rail networks, enabling efficient transportation of cargo. Kamarajar Port, on the other hand, has a relatively new Ro-Ro terminal that is still under development. The port has invested in the construction of a dedicated Ro-Ro terminal that can handle multiple vehicles at once. However, it is yet to be seen how this infrastructure will perform in the long run.

Quality of services:

The quality of services provided by the Ro-Ro terminals is an essential factor that affects the overall performance of the ports. Chennai Port has a dedicated customer service team that is available 24/7 to handle customer queries and complaints. The port also provides additional services such as vehicle cleaning, maintenance, and repair facilities, making it more convenient for customers to use their services. Kamarajar Port is also striving to provide quality services to its customers by investing in the development of modern infrastructure, efficient operations, and customer support.

the comparison and interpretation of the performance of Ro-Ro Terminal in Chennai Port and Kamarajar Port based on the percentage of cars handled in the FY 21-23 suggest that Chennai Port is more efficient and capable of handling a higher volume of cars than Kamarajar Port. However, this percentage-based comparison only provides a partial picture of the overall performance of the two ports.

**CHAPTER V**  
**Conclusion and Recommendations**

## 5.1. Findings

This study titled “A study on RO–RO Terminal in Chennai Port in comparison with other major ports in Tamil Nadu”. The study found that while Chennai Port has shown improvement in recent years, it still lags behind other major ports in India, such as VOC Port and Kamarajar Port, in terms of cargo handling capacity and turnaround time.

The study identified several key factors that influence the success of Ro-Ro terminals, including infrastructure, technology, connectivity, and skilled labour. The study recommended that the port authority invest in upgrading its infrastructure, adopt advanced technologies such as automation and digitization, focus on enhancing its connectivity with the hinterland, and invest in training and development programs for skilled labour.

The study highlights the importance of Ro-Ro terminals in facilitating efficient and cost-effective cargo transportation, particularly for goods that are time-sensitive or perishable. Ro-Ro terminals are a critical component of global trade, and their success is essential for the growth of the Indian economy.

Further research could explore the impact of environmental factors such as climate change on the efficiency and effectiveness of Ro-Ro terminals, and identify strategies for mitigating these risks.

Further the study provides valuable insights into the factors that contribute to the success of Ro-Ro terminals and the strategies that could be adopted to improve their performance. The study is expected to provide a useful reference for port authorities, policymakers, and industry stakeholders involved in the planning, development, and operation of Ro-Ro terminals in Tamil Nadu.

## 5.2. Conclusion

Chennai is a significant manufacturing city in India, with a well-developed supply chain and infrastructure. It is home to a slew of automakers, including Hyundai, Ford, Renault-Nissan, Because of its strategic position, talented workforce, and favourable business climate, the city has become an appealing destination for automotive investments. Due to this Ports in Chennai has huge potential of handling Ro-Ro cargoes.

Chennai Port Authority plays a significant role in facilitating Ro-Ro (Roll-on/Roll-off) cargo movement from Chennai. From the study it has been found that although Kamarajar Port Ltd. has more users who exports manufactured cars like Daimler, Nissan & Renault, Ford, Isuzu, Toyota, Maruti etc. Chennai Port has limited users including Hyundai, Kia who provide large volumes which sum up to surpass total volume of Kamarajar Port. V.O.C Port Tuticorin has initiated to handle Ro-Ro cargoes still they are very few on numbers and handles Lo-Lo cargoes like wind mill blades and heavy machineries.

Chennai Port Authority which is in heart of the city is facing the challenge of limited backup space for future expansions. But still Kamarajar Port Limited is less preferred since they handle huge amount of dusty cargo which will affect cleanliness of the cars exported. To counter the challenge, they are exploring new technologies like car washing gantry. Comparing with Chennai Port Authority travel distance is also high to access KPL. Even though Kamarajar Port is the next rival, it is a wholly owned subsidiary of Chennai Port.

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