A STUDY ON THE PORT CONGESTION OF THE SEAPORTS IN CHENNAI CLUSTER

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Abstract: *Maritime Transport plays important role for the trade and economic growth in India, contributes 90% in terms of volume and 77% in terms of value. India has 12 Major Ports and 148 Minor Ports; the 12 major ports handle the 75% of traffic. India is ranked one among the top five countries for outsourcing destination in the world, so trade growth in India is inevitable. The Infrastructure, Facilities and Processes of Indian Ports to be upgraded to world standards otherwise it will be huge loss of trade potential for the ports. The major ports in India are working at more than 100% of their design capacity which leads to port congestion. The Public-Private investment which is encouraged by the government showing better results in view of infrastructure and port facilities development but still long way to go in order to compete with world's best ports standard. The study recapitulates the port congestion faced by seaports in Chennai Cluster.*

Keywords: *Chennai Cluster, Congestion, Vessel, Ports, hinterland connectivity, Draft, Berth.*

I. INTRODUCTION

The Port congestion is one of major challenge which maritime industry faces worldwide. The port which encounters this problem should take steps immediately and within stipulated period to overcome it otherwise the port will lose its business, this will directly affect the economic growth of the region. The growth in traffic of a port exceeds its capacity which leads to port congestion and low productivity. The port faces the port congestion in many ways like, geographical location of the port, port infrastructure, port facilities, documentation process, hinterland connectivity and best port management practices. The Indian major port performance for the year 2016-2017 the traffic handled is 647.6 in Million Tonnes, average pre-berthing time on port account is 5. 77 hours, average total turn-round time is 3.43 days, average output per ship birth day is 14576 Tonnes, the above records show the Indian ports required to improve its efficiency to compete with world class ports. The study elicits the Port congestion in seaports in Chennai Cluster such as Chennai port, Kamarajar port Limited (Ennore port) and Kattupalli port.

1.1 Chennai Port

Chennai Port, the third oldest port among the 12 major ports, the Chennai city from past has evolved as metro city in view of the Chennai port which was built during British period. The initial piers were built in 1861, but the storms of 1868 and 1872 made them inoperative. The Chennai Port was designed by the Sir Francis Spring in 1904 was chairman for Chennai Port Trust, now it is an emerging hub port for Containers, Cars and Project Cargo in the East Coast of India. The Chennai port plays gateway of all cargos and completed serving nation for 135 years. Chennai port is situated in the heart of the city, surrounded by residential area and implementation of physical expansion of the port and the terminal is not viable. The Chennai port is one of the Major port and 2nd largest port in India which faces Port Congestion problem in bigger scale. The Chennai port lost its coal & iron ore cargo due to high court orders on 2011 in view environmental aspect which still port fighting legally.

Chennai port faces hinterland connectivity problem, lack of parking space for truck within port areas. Port hinterland connectivity from road bottle necked near port area 15-20 km due city traffic. Chennai port initiated to solve this planned a project launched on 2009 and work started on 2010 Elevated expressway from poonamallee / maduravoyal to the Zero Gate (Chennai Port) unfortunately this project was not completed till now. The Shipping ministry announced on June 2017 that Chennai Port - Maduravoyal 4 lane Expressway will be resumed and the 19 km stretch of the elevated expressway will soon be extended by another 10 km, the NHAI is likely to form a committee to monitor the progress of the project. Fresh tenders are likely to be floated for the entire stretch of 29 km, including the extension route. EMRIP Ennore -Manali Road Improvement program conceived nearly twenty years ago, the Chennai Ennore Port connectivity project a mere upgradation of the existing road in a stretch of hardly 30 kilometers has not yet been completed. The latest hitch holding up the project for the last two years is due to the failure of Tamil Nadu Government to remove obstructions near the entrance of Chennai Port at NTO Kuppam (slum settlement) and near the fisheries harbor.

The container-laden vehicles got stuck at various points leading up to ChPT main gate (zero gate) owing to shortage of customs officials for seal verification, reduced number of entry points and stoppage of vehicles at different points by traffic police and other agencies. The congestion led to haphazard parking of vehicles, affecting the movement of office-goers and residents of north Chennai. The congestion also led to diversion of containers and other commodities to nearby ports such as Krishnapatnam (granite), Karaikal, Kakinada, Visakhapatnam (iron ore), Kamarajar (coal), L&T Kattupalli and VO Chidambaranar Port Trust and led to a dip in the ChPT's volume for the last two years.The Chennai Port due to poor hinterland connectivity lost car exports companies such as Nissan Motor India Pvt. Ltd and Toyota Kirloskar Motor Pvt. Ltd have chosen the Ennore port, 20km away, over the Chennai port for car exports.The Chennai port delays have led Lapp India Pvt. Ltd, which manufactures cables at a factory in Bangalore, to consider receiving its copper imports at the Nhava Sheva port in Maharashtra. According to estimates, more than 40% of cargo originated in this region goes to other ports due to port issues. The Port has three docks and two container terminals, total 24 berths, draft ranging from 8.5 meters to 16.5 meters which none of the neighboring port has got is much infrastructure. Chennai Port is one of the five major ports in the country that have been identified by the Ministry of Shipping for development of cruise terminals, other four being Goa, Kochi, Mumbai and Mangaluru. The passenger cruise terminal is located in the West Quay with facilities like immigration, scanning, health checkup and duty-free shops. The proposed dry port at sriperumbudur by Chennai Port which still at preliminary stage which required to developed as early as possible which will help to reduce Chennai port congestion. Port congestion of Chennai should be handled such way it establishes as friendly port for its port users.

1.2 Kamarajar Port Limited

Kamarajar Port was originally conceived primarily to handle thermal coal to meet the requirement of Tamilnadu Generation and Distribution Corporation (TANGEDCO) and was endowed with large chunks of land (about 2,000 acres). Kamarajar Port Limited (KPL) also called as Ennore Port, designed as a world-class port, it has the capacity to develop 20 berths for handling a variety of bulk, liquid, automobile and container cargo. The Kamarajar port also faces port congestion issues but not much when compared with Chennai port. Port has more ongoing project like new LNG terminal, multi-cargo terminal is being developed by the Chettinad group, 2 more Coal berths, planned to undertake dredging work so that 18-meter draft can be achieved etc. In view of completion of these projects within few years the Port traffic volume will be high which could lead to port congestion problems if proper steps are not taken now.

EMRIP Ennore-Manali Road improvement program conceived nearly twenty years ago, the Chennai Ennore Port connectivity project has not yet been completed. The latest hitch holding up the project for the last two years is due to remove obstructions near the entrance of Chennai Port at NTO Kuppam (slum settlement) and near the fisheries harbor. kamarajar port also taking steps for preventing the congestion like project through Southern railways, Northern rail link from Minjur station to Kamarajar Port. To meet its future needs, KPL purchased 651 acres from the Salt department for nearly Rs. 500 crores. The land will be used for constructing an open stockyard, truck parking yard, warehouses, liquid cargo storage terminal and a free trade warehousing zone.

1.3 Kattupalli Port

Kattupalli port is india's most modern port complex with integrated shipyard and it was taken over by Adani Ports and Special Economic Zone Ltd, (APSEZ) under Adani Kattupalli Private Limited (AKPPL). The port uses latest technology, adopts best method to establish Kattupalli Port world class port. Kattupalli started commercial operations in January 2013 from two berths with a total length of about 710 metres. The berths are designed to handle container, dry bulk and break-bulk cargo. kattupalli port facilities to build commercial ships, defence ships including submarines, Refitting and re-engineering of commercial and defence ships and Off-shore platforms. Kattupalli port is newly built port at strategically located such way port congestion is avoided at the same time lots of room for expansion of the port. The Chennai outer ring (CORR) Phase 11 expected to complete by Dec 2017 now 92% of the work on the second phase of the Chennai Outer Ring Road (CORR) project from Nemilicheri to Minjur has been completed. The CORR phase 11 upon completion will help Kattupalli better hinterland connectivity by road. The CONCOR (Container Corporation of India) has commenced a new train service for import containers from Kattupalli Port to Inland Container Depot (ICD)WhiteField, Bangalore via CONCOR Tondiarpet, in Tamil Nadu.

II. LITERATURE REVIEW

The Congestion inside the port is not only experienced by Chennai but is reported in several major ports in India and abroad including Navi Mumbai, Vishakhapatnam, Los Angeles, Long Beach, and Manila. Congestion in the port is contributed by the growth in international trade together with the reality that many port facilities are running at or near capacity leading to traffic and port congestion (Vacca, Bierlaire and Salani 2007).

The port operators are concerned about the longer truck waiting time, lower operation efficiency and the downgrade of overall freight productivity. A study commissioned by National Chamber Foundation of U.S. Chamber of Commerce (2003) states that " a typical congestion at port gates is worse than that experienced on freeways during rush hours in metropolitan areas."

Numerous studies (Huynh and Hutson, 2005; Huynh and Walton, 2008) have discussed about an efficient truck appointment system to reduce truck waiting time. A successful appointment system will result in guaranteed entry times, reduced queue lengths, and shorter truck turn times. Huynh and Walton (2008) evaluated the effect of truck arrival patterns on truck turn times and crane utilization rates through a heuristic search process.

To date solutions for congestion of port were focused on reduction of waiting time and turn time with policies such as extended gate time, and truck appointments. The congestion inside the port is also contributed by the inefficient operation of terminals such as longer checking time, time breaks, and under performance of utility equipment. O'Brien and Griffin (2014) recommend streamlining the movement and operation of trucks and cargo handling equipment to alleviate congestion in terminal.

Coordinated efforts at Chennai aimed at speeding truck turn times have yielded significant positive results. Average truck visit times from container freight stations to port gates have been reduced from roughly 40 hours in 2014 to nearly 15 hours earlier this year and to just over seven hours as of June 1, according to the JICA report.

Roso.V (2007) stated as in the case of linking to a seaport, efficient distribution and Environmental benefits are achieved by setting up the link through a high-capacity rail link. An economic premise is that the high-capacity or high efficiency rail connection must operate with a lower unit cost than the transport of containers by road. The containers are assembled from the seaport to distribute to their ultimate destinations with the modal transfer between rail and road taking place at the inland site.

Congestion implies loss of time and money, and therefore undermines the competitive position of ports and maritime logistics chains. Consequently, maximum efforts must be made to avoid such maritime congestion. To this end, insight is required into present and future developments in maritime transport and port throughput, as well as into the strategic behaviour of the various market players involved. Hilde Meersman, Eddy Van de Voorde and Thierry Vane/slander (2012).

Increases in transportation costs caused by congestion hurts the U.S. economy and the nation's international competitiveness. Cargo and supply chain interests, particularly those that depend on just-in-time performance, are substantially affected by congestion. Trucking costs are particularly susceptible to the effects of delays brought about by congestion because those delays directly reduce driver and truck productivity. Ocean carriers also suffer higher costs arising from delays and when those delays accumulate they may ultimately lead to ships and cargo being diverted to other competing ports, including foreign ones. Delays caused by congestion increase supply chain costs directly by causing inbound and outbound freight distribution costs to rise. These delays also indirectly increase supply chain costs by forcing importing and exporting companies to increase order fulfillment lead times and hold greater inventory levels. Such delays result in lost revenue due to slowed production, spoiled and unsaleable cargo, missed sale opportunities, increased stock-outs, and delayed introduction of new products. In addition, such delays may reduce U.S. international market share in various economic sectors and reduce U.S. GDP. Depending on the extent, duration, and nature of these delays, the national indirect cost impact of congestion is likely to surpass by a wide margin the direct impact of delays on freight distribution costs, (U.S. Container Port Congestion and Related International Supply Chain Issues, FMC Port Forums, 2015)

Despite some continuing challenges, there are positive signs in India's ports sector and the potential for growth and development is enormous. However, India's port sector is currently facing structural problems which require innovative solutions from all stakeholders involved in the sector. Policy reforms to improve connectivity between ports and other modes of transport, including increasing rail shares, expediting government approval processes and upgrading infrastructure, are key to addressing the capacity constraints facing the industry.

Connie Chen (India spring board, April 2014 issue of Port strategy, 2014 Holman Fenwick Willan LLP.)

The Direct Port Delivery (DPD) programme that allows importers to take delivery of their cargo directly at the container terminals is picking up at Chennai port. Nearly 19 per cent of all import cargo at the port is cleared under this program. It was a gradual pick up because of last mile connectivity issues at the terminals. The usual practice is that an import container on landing at container terminal is first taken to a designated container freight station (CFS) from where importers take delivery of cargo. However, with DPD, importers can take the cargo directly to the factory saving nearly ₹5,000 per box. (Te Raja Simhan, Business line)

III. RESEARCH OBJECTIVES

The study has got the following research objectives:

- To identify the opinion of the seaport users about the Port congestion with regard to the seaports in Chennai Cluster.
- To compare the Port congestion which the port users faces in Chennai Port, Kamarajar Port and Kattupalli Port.

Research Hypotheses

In order to achieve the objectives, the researcher has set the following hypotheses:

H_1: There is a significant difference in the opinion given by the port users about the port congestion in the seaports of Chennai Cluster.

The Chennai Cluster is sub-divided into three seaports and hence there could be three hypotheses to be tested individually. They are as follows:

H_{11}: There is a significant difference in the opinion given by the port users about the port congestion in Chennai Port.

H_{12}: There is a significant difference in the opinion given by the port users about the port congestion in Kamarajar Port (Ennore Port).

H_{13}: There is a significant difference in the opinion given by the port users about the port congestion in Kattupalli Port.

Research Methodology

The study considered the users of seaports in the Chennai Cluster as the target population. The sample size was calculated based on the population size by using the sampling formula suggested by Cochran (1963) with 95% confidence level and ±5% precision. The sample size fixed up for the study is 150. The sample responses were obtained by using Multistage Random Sampling Method. The infrastructural facilities were measured on a five-point scale (Likert scale) from 1 (Strongly Disagree) to 5 (Strongly Agree).

IV. ANALYSIS AND INTERPRETATION

6.1 Descriptive Data Analysis

The demographic details of the port users of the seaports such as Chennai port, Kamarajar port & Kattupalli port in the Chennai Cluster are given in Table-1. It can be inferred that more percentage of port users of all the three ports falls under 30-40 age category. Moreover, the majority of the type of port users is NVOCC/MTOs. The majority of the port users have Diploma education and the port users experience with port operation happens to be 5-10 years.

Table-1: Descriptive Data Analysis

Demographic Factors	Chennai Port (in %)	Kamarajar Port (in %)	Kattupalli Port (in %)
Age of Port User			
20 - 30	14	12	11
30 - 40	48	52	42
40 - 50	20	24	22
50 - 60	14	9	11
> 60	4	3	14
Type of Port User			
Port Agent	11	9	7
Freight Forwarder	18	14	11
NVOCC / MTO	24	34	36
Logistics Service Provider	22	18	17
Exporter / Importer	18	11	22
Others	7	14	7
Education of Port User			
10th Standard	2	4	3
12th Standard	22	31	18
Diploma	42	38	38
UG Degree	21	19	32
PG Degree	13	8	9
Experience in Port Operation			
Below 2 years	12	8	12
2-5 years	22	42	38

Demographic Factors	Chennai Port (in %)	Kamarajar Port (in %)	Kattupalli Port (in %)
5-10 years	28	41	21
10-15 years	32	8	23
Above 15 years	6	1	6

6.2 Reliability and Validity Testing

The constructs in the questionnaire were tested for reliability and consistency by calculating cronbach's alpha for the factors of Port Congestion and found to have satisfactory values of 0.91. This shows that the constructs are consistent and reliable.

6.3 Analysis of Variance (ANOVA)

In order to test the hypotheses, Analysis of Variance was applied. The F-values and the corresponding p-values are given in Table-2. In order to test the hypotheses such as H_{11}, H_{12} & H_{12}, one way Analysis of Variance is used. By carefully analysing the p-values, it can be inferred that the p-values for some of the factors pertaining to port congestion are less than 0.05 and hence the hypotheses H_{11}, H_{12} & H_{12} can be accepted. It can be interpreted that the factors of port congestion for Chennai port, Kamarajar port & Kattupalli port are acceptable from the port users point view. The port congestion factors highlighted by the users of the ports are Planned Layout of the Port, Availability of required equipment in the port, Equipment used at port are energy efficient, Cargo Loading rate, Cargo Discharging rate, Non-availability of vessels on berth, Quick Turn-around time of vessels, Vessels turnaround time as every year showing progressive growth, Port Facilities are provided for vessels at anchorage, Vessels at anchorage are promptly informed the berthing prospects, Port has facility for berthing / un-berthing operations during night hours, Round the clock Pilot availability for vessel berthing / un-berthing, Port entry & exit area is made simple to avoid any congestion, The vessel availability for both feeder and mother vessel connectivity, Port staff are skilled & experience, Port staff Skilled & experience at all levels of operations, The ship approach and terminal berth distance within acceptable limits, Average output of vessel at berth per day measured in tonnes of cargo, Average output of ship at berth per day measured in tonnes of cargo every year showing progressive growth, Dedicated berth for Coastal vessels, Congestion on the Shipping lane/route that connects ships to the port, Congestion on port entry or access to a particular terminal, Congestion of trucks within port or terminal, Storage capacity for cargo at storage yards and sheds, Traffic Congestion along the landward access route to the port, Traffic Congestion associated with internal mobility in port, Delays for cargo caused by cumbersome registration, licensing or documentation process, Port location for future development.

Table-2: One way ANOVA of the factors of Port Congestion

Infrastructure Facilities	Chennai Port	Kamarajar Port	Kattupalli Port
	F-Value (p-Value)	F-Value (p-Value)	F-Value (p-Value)
Planned Layout of the Port	3.16 (0.005)	3.23 (0.008)	3.45 (0.002)
Availability of required equipment in the port	6.16 (0.175)	5.45 (0.227)	7.14 (0.281)
Equipment used at port are energy efficient	2.12 (0.016)	2.33 (0.009)	3.25 (0.018)
Cargo Loading rate	2.14 (0.018)	2.16 (0.007)	2.59 (0.018)
Cargo Discharging rate	3.24 (0.008)	3.24 (0.016)	2.13 (0.013)
Non-availability of vessels on berth	2.21 (0.017)	2.12 (0.028)	3.55 (0.014)
Quick Turn-around time of vessels	4.44 (0.045)	4.28 (0.032)	3.35 (0.005)
Vessels turnaround time as every year showing progressive growth.	2.11 (0.007)	3.22 (0.009)	3.35 (0.021)
Port Facilities are provided for vessels at anchorage	2.36 (0.018)	2.18 (0.016)	3.32 (0.015)
Vessels at anchorage are promptly informed the berthing prospects.	3.44 (0.035)	3.28 (0.035)	4.35 (0.042)

Infrastructure Facilities	Chennai Port	Kamarajar Port	Kattupalli Port
	F-Value (p-Value)	F-Value (p-Value)	F-Value (p-Value)
Port has facility for berthing / un-berthing operations during night hours	2.45 (0.014)	6.67 (0.235)	7.34 (0.532)
Round the clock Pilot availability for vessel berthing / un-berthing	2.34 (0.005)	2.56 (0.012)	2.34 (0.014)
Port entry & exit area is made simple to avoid any congestion.	3.12 (0.029)	2.12 (0.012)	2.15 (0.017)
The vessel availability for both feeder and mother vessel connectivity.	2.72 (0.028)	4.15 (0.048)	2.22 (0.068)
Port staff are skilled & experience	4.25 (0.044)	3.13 (0.036)	4.02 (0.016)
Port staff Skilled & experience at all levels of operations.	3.46 (0.009)	2.69 (0.018)	3.12 (0.012)
The ship approach and terminal berth distance within acceptable limits	3.46 (0.016)	2.45 (0.007)	3.46 (0.028)
Average output of vessel at berth per day measured in tonnes of cargo	3.12 (0.016)	2.21 (0.006)	3.25 (0.018)
Average output of ship at berth per day measured in tonnes of cargo every year showing progressive growth	2.14 (0.028)	3.16 (0.017)	3.19 (0.018)
Dedicated berth for Coastal vessels	2.11 (0.017)	2.17 (0.028)	2.02 (0.003)
Congestion on the Shipping lane/route that connects ships to the port	3.21 (0.027)	3.22 (0.018)	3.25 (0.017)
Congestion on port entry or access to a particular terminal	3.44 (0.004)	3.28 (0.003)	3.35 (0.034)
Congestion of trucks within port or terminal.	2.11 (0.017)	3.22 (0.024)	3.35 (0.021)
Storage capacity for cargo at storage yards and sheds	3.21 (0.027)	2.12 (0.012)	3.55 (0.017)
Traffic Congestion along the landward access route to the port	3.44 (0.014)	4.28 (0.035)	3.35 (0.014)
Traffic Congestion associated with internal mobility in port	3.11 (0.017)	2.22 (0.024)	3.35 (0.025)
Delays for cargo caused by cumbersome registration, licensing or documentation process	3.44 (0.025)	3.28 (0.013)	3.35 (0.034)
Port location for future development	2.11 (0.009)	3.22 (0.024)	3.35 (0.025)

*: the values in the brackets represent p-values

V. CONCLUSION

Port Congestion is growing worldwide, as an increase in container traffic over the past year and ongoing consolidation in the shipping industry compound other problems such as inefficient transfer to inland transportation, customs delays, and episodic weather- and labor-related slowdowns. Across the world, “delays have serious effects on just-in-time distribution systems, which seek to reduce inventory and distribution costs, and on lean production techniques, which seek to cut down on sources of waste in manufacturing,” according to the International Chamber of Commerce. Delays result in huge costs for importers and a serious lack of predictability and reliability in supply chains. The problem can drive companies to switch to less-congested ports. For over a year now, Chennai port has been facing cargo congestion problems affecting the trade. Frequent strikes by vehicle operators carrying containerized cargo and poor road connectivity to the port have led to the congestion. This has delayed delivery of cargo to customers abroad. Every sector has been badly hit by the congestion. The roads are still bad and there is no alternative route for the truckers. The Ennore-Manali highway is vital for the movement of vehicles in and out of the port. The National Highways Authority of India, along with the Tamil Nadu government, is engaged in widening the highway. The Chennai Port Trust and Kamarajar Port Ltd are partners in the special purpose vehicle created for this project. This project and the elevated road corridor from Chennai port to Maduravoyal are important for Chennai port's growth.

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