

A COMPARATIVE PERFORMANCE STUDY OF CONTAINER HANDLING AT EASTERN AND WESTERN MAJOR PORTS IN INDIA

B.V. Ramaligeswara Rao¹ & CherukuruVaishnavi Naidu²

¹*Research Scholar, Faculty & Academic Co-ordinator, Indian Maritime University, Visakhapatnam Campus, India*

²*Research Scholar, BBM, PGDM (Logistics Management (CII)), MBA Operations & Finance)*

Sri Sri University, Odisha, India

ABSTRACT

India's seaport performance is well below the benchmark of international productivity. Therefore, the researcher will make an attempt to assess the container handling performance of ports during the last decade. As per the results among thirteen major ports, seven ports performance seems to be increasing but still inefficient with their existing infrastructure and other ports are efficient ports. Therefore, the optimum utilization of the infrastructure is needed for sustainable growth of the nation.

KEYWORDS: *Container Handling, Performance, Efficient Ports, Infrastructure*

Article History

Received: 15 Feb 2019 | Revised: 02 Mar 2019 | Accepted: 19 Mar 2019

INTRODUCTION

Container ports efficiency is an important factor to stimulate competitiveness and regional development. With the growth of the international sea traffic and the technology changes in the maritime transport industry seaports are obliged to provide progressive technology. They became forced to improve port efficiency to provide comparative advantages that will attract more traffic. Thus, the global container transportation system was developed rapidly since its inauguration in 1960; this is caused by the continued increase in the size of container ships, the automation in cargo handling systems and the continued specialization of container terminals. Ports are the major hubs of international trade and primary catalysts of local economic development in an era of globalization (Jung, 2011). Approximately 90% of international cargo is transported through ships. There are about 4,764 ports around the world handling more than 80% of trade (ICS, 2015). Thus, the strategic economic importance of maritime transport as a trade enabler cannot be overemphasized. Total world port traffic has been growing at 6% to 8% per annum. The trade competitiveness of all countries – developed and developing alike, and including landlocked countries – depends heavily on effective access to international shipping services and port networks. Developing countries such as China and India are major drivers for port development due to their high economic growth rates. India is having a large growth in international trade (over 25% compounded annual growth rate from 2003–2004 to 2008–2009). Now, 95% of India's trade by volume and 77% by value move through Indian ports. This trend is also true worldwide, with over 9 billion tonnes of goods shipped internationally in 2012, and an estimated growth rate of 4.3% per year (UNCTAD, 2013). Due to the changes in the port industry, most countries are making great efforts to secure their ports as a hub by investing enormous funds on port facilities and by improving efficiency in port operations and management (Lee and Kim, 2006), which thus become an important area of study. Data

collection of key operations in a Main objectives of Indian ports are increasing the revenue of the nation and serving its people by fulfilling their needs, through export-import. There is a long-felt need of developing a standardized measure by which the relative standing (as well as the absolute standing) of different major ports can be assessed, which helps in making a policy decision for improvement of the port scenario. The inter-comparison is based on generalized performance indicators that reflect operational efficiency. To further standardize the measures different rates and ratios involving performance indicators have been considered to create uniformity amongst performance of different ports for making their performance comparable.

Classification of Containers

A Container is made by Steel and Aluminium. The International Standard Organization (ISO), has given the size of container i.e., 20 feet and 40 feet in length, 8' feet in breadth and 8 ½, 9 ½ feet in height. The internal volume of Twenty-Foot Equivalent unit (TEU) is 33M³ (Cubic meters) Thus, Container can be classified according to their size; they are 20', 40', 45', 48', 60' and refrigerator containers. The types of Containers are Open top, Open Size, Flat racks, half height, Pens, Tank Containers, and Customized Containers.

Benefits of Containerisation

Containerized cargo is transported by rail/ road/ waterways to hinterland warehouses/ distribution centers. The International trade of exports and imports have benefited by containerization and multi-modal transportation in two ways - by reducing costs and improved customer service i.e., Reduce freight, Packing cost, Insurance Premium, Warehousing cost and Lowering inventory.

Containerisation has facilitated four trends which results in world trade and globalization:

- A shift from Ocean carrier to total logistic systems or inter modals
- Globalization of Production facilities
- Greater Concentration of trade flows
- The rise of supply chain management as a discipline

Objectives of the Study

- To examine the container handling performance in Indian ports
- To compare the western and Container Handling at Eastern and Western Major Ports in India
- To suggest suitable policy recommendations

METHODOLOGIES

In this study based on secondary sources from different relevant books, reports, research articles, journals, annual reports, and magazines. The port system serves not only as an integral component of the transport system but also as a major sub-system of the broader production and logistics systems (Bichou and Gray, 2004). Ports play a vital role in the regional economy to provide the link between suppliers and customers. From an economic perspective, ports are increasingly related to the competitiveness of economies (Sanchez et al., 2003). Consequent to globalization, port performance has become increasingly important for international trade (Bichou and Gray, 2004). The capacity, as well as

the efficiency of the ports, can be measured by using different performance indicators. The indicators are filtered against specific criteria and evaluated by port stakeholders in order to obtain a set of indicators suitable to be implemented (Puiga et al., 2004; Bryan et al., 2007). The compare performance indicators are utilized to assist in the understanding of port performance trends, which can indicate actions to handle noted situations. The performance indicators give a basis of assessment of capabilities of management and/or operators and/or equipment's, which can be improved and inculcated in port planning measures. The measurements of port performance are applicable for port Data Collection The data for this study is mainly from Secondary data from Indian Ports Association, Ministry of Shipping, United Nations Conference on Trade and Development (UNCTAD) and Rail Maritime and Transport (RMT) Publications.

LITERATURE REVIEW

There are several studies on the evaluation of the operational performance of the ports in the different region.

The initial study was done by Roll and Hayuth (1993) measured the port efficiency through data envelopment analysis (DEA).

Spanish port performance was measured by Martinez – Budria et al. (1999)

Coto-Millan, P (2000) measured 27 Spanish ports performance and it found that smaller ports are more efficient in comparison to bigger ports.

Tongzon (2001) evaluated the port performance of 16 container terminals in various countries in the world.

From the existing literature, it was also found that most of the studies adopted data envelopment analysis (DEA) for measuring the efficiency, Itoh (2002) suggested that DEA is the most suitable model for measuring port efficiency.

Turner, Hetal (2004) analyzed top 26 ports in the region of the United States and Canada and categorically asserted that bigger ports are efficient.

Al – Eraqi A.S. et al (2008) found the efficiency of 22 major seaports in the region of Middle Eastern and East African and concluded that bigger ports are efficient.

Sohn, J, and Jung, G (2009) studied the operational efficiency of 16 Asian ports and concluded that larger ports show better efficiency.

In this direction present study is interested to carry out an evaluation of operational efficiency of selected major ports in India during 1993 – 2011 with sophisticated model i.e. Data Envelopment Analysis models.

Table 1: Container Traffic Handled at Eastern Ports for F.Y. 2013-14 to 2017-2018 (in 000 Tonnes, Teus)

| Sl. No | EAST PORT | Unit | 2013-2014 | | | 2014-2015 | | | 2015-2016 | | | 2016-2017 | | | 2017-2018 | | | TOTAL | | |
|------------|--------------------|---------|-----------|--------|------|-----------|--------|------|-----------|--------|------|-----------|--------|------|-----------|--------|------|---------|--------|------|
| | | | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank |
| 1 | KOLKATA | Tonnage | 7063 | 13.39 | 3 | 8110 | 14.62 | 3 | 9263 | 15.83 | 3 | 9887 | 16.30 | 3 | 9760 | 15.37 | 3 | 44083 | 15.15 | 3 |
| | | TEUs | 449 | 15.98 | | 528 | 17.64 | | 578 | 18.71 | | 636 | 19.40 | | 640 | 18.59 | | 2831 | 18.13 | |
| 2 | HALDIA | Tonnage | 2230 | 4.23 | 5 | 1958 | 3.53 | 5 | 1376 | 2.35 | 5 | 2467 | 4.07 | 5 | 2672 | 4.21 | 5 | 10703 | 3.68 | 5 |
| | | TEUs | 113 | 4.02 | | 102 | 3.41 | | 85 | 2.75 | | 136 | 4.15 | | 156 | 4.53 | | 592 | 3.79 | |
| 3 | PARADIP | Tonnage | 99 | 0.19 | 6 | 67 | 0.12 | 6 | 132 | 0.23 | 6 | 42 | 0.07 | 6 | 98 | 0.15 | 6 | 438 | 0.15 | 6 |
| | | TEUs | 9 | 0.32 | | 4 | 0.13 | | 5 | 0.16 | | 2 | 0.06 | | 7 | 0.20 | | 27 | 0.17 | |
| 4 | VISAKHAPATNAM | Tonnage | 4916 | 9.32 | 4 | 4372 | 7.88 | 4 | 5145 | 8.79 | 4 | 6428 | 10.60 | 4 | 6835 | 10.76 | 4 | 27696 | 9.52 | 4 |
| | | TEUs | 262 | 9.33 | | 248 | 8.28 | | 245 | 7.93 | | 367 | 11.20 | | 389 | 11.30 | | 1511 | 9.68 | |
| 5 | KAMARAJAR (ENNORE) | Tonnage | 0 | 0.00 | 7 | 0 | 0.00 | 7 | 1 | 0.00 | 7 | 1 | 0.00 | 7 | 2 | 0.08 | 7 | 54 | 0.02 | 7 |
| | | TEUs | 0 | 0.00 | | 0 | 0.00 | | 0 | 0.00 | | 0 | 0.00 | | 3 | 0.09 | | 3 | 0.02 | |
| 6 | CHENNAI | Tonnage | 28330 | 53.69 | 1 | 29945 | 53.97 | 1 | 30207 | 51.63 | 1 | 28850 | 47.56 | 1 | 29905 | 47.08 | 1 | 147237 | 50.61 | 1 |
| | | TEUs | 1468 | 52.26 | | 1552 | 51.84 | | 1565 | 50.65 | | 1495 | 45.61 | | 1549 | 45.00 | | 7629 | 48.86 | |
| 7 | V.O. CHIDAMBARANAR | Tonnage | 10129 | 19.20 | 2 | 11034 | 19.89 | 2 | 12388 | 21.17 | 2 | 12991 | 21.41 | 2 | 14192 | 22.34 | 2 | 60734 | 20.87 | 2 |
| | | TEUs | 508 | 18.08 | | 560 | 18.70 | | 612 | 19.81 | | 642 | 19.59 | | 698 | 20.28 | | 3020 | 19.34 | |
| EAST PORTS | | Tonnage | 52767 | 100.00 | | 55486 | 100.00 | | 58512 | 100.00 | | 60666 | 100.00 | | 63514 | 100.00 | | 290945 | 100.00 | |
| | | TEUs | 2809 | 100.00 | | 2994 | 100.00 | | 3090 | 100.00 | | 3278 | 100.00 | | 3442 | 100.00 | | 15613 | 100.00 | |

Source: Ministry of Shipping (<http://shipmin.gov.in>)

Comparing with the previous year (2013-14) the traffic handled in 2014-15 is increased to 5.2%. Comparing with the previous year (2014-15) the traffic handled in 2015-16 is increased to 5.5%. Comparing with the previous year (2015-16) the traffic handled in 2016-17 is increased to 3.7%. Comparing with the previous year (2016-17) the traffic handled in 2017-18 is increased to 4.7%.

Hence the traffic handled at Eastern cost has increased for the last five years on average 4.7%.

Table 2: Container Traffic Handled at Western Ports for F.Y.2013-14 to 2017-2018 (in 000 Tonnes, Teus)

| Sl. No | WEST PORT | Unit | 2013-2014 | | | 2014-2015 | | | 2015-2016 | | | 2016-2017 | | | 2017-2018 | | | TOTAL | | |
|------------|---------------|---------|-----------|--------|------|-----------|--------|------|-----------|--------|------|-----------|--------|------|-----------|--------|------|---------|--------|------|
| | | | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank |
| 1 | COCHIN | Tonnage | 4785 | 7.73 | 2 | 5246 | 8.20 | 2 | 5785 | 8.95 | 2 | 6840 | 10.69 | 2 | 7692 | 10.97 | 2 | 30348 | 9.35 | 2 |
| | | TEUs | 347 | 7.47 | | 366 | 7.37 | | 419 | 8.28 | | 491 | 9.51 | | 556 | 9.76 | | 2179 | 8.54 | |
| 2 | NEW MANGALORE | Tonnage | 747 | 1.21 | 3 | 920 | 1.44 | 3 | 1105 | 1.71 | 3 | 1411 | 2.20 | 3 | 1743 | 2.49 | 4 | 5926 | 1.83 | 3 |
| | | TEUs | 50 | 1.08 | | 63 | 1.27 | | 76 | 1.50 | | 95 | 1.84 | | 115 | 2.02 | | 399 | 1.56 | |
| 3 | MORMUGAO | Tonnage | 236 | 0.38 | 6 | 312 | 0.49 | 5 | 345 | 0.53 | 5 | 402 | 0.63 | 5 | 425 | 0.61 | 6 | 1720 | 0.53 | 6 |
| | | TEUs | 19 | 0.41 | | 22 | 0.44 | | 26 | 0.51 | | 30 | 0.58 | | 32 | 0.56 | | 129 | 0.51 | |
| 4 | MUMBAI | Tonnage | 450 | 0.73 | 5 | 544 | 0.85 | 4 | 574 | 0.89 | 4 | 639 | 1.00 | 4 | 556 | 0.79 | 5 | 2763 | 0.85 | 4 |
| | | TEUs | 40 | 0.86 | | 45 | 0.91 | | 43 | 0.85 | | 43 | 0.83 | | 42 | 0.74 | | 213 | 0.83 | |
| 5 | J.N.P.T. | Tonnage | 55234 | 89.23 | 1 | 56933 | 89.02 | 1 | 56791 | 87.84 | 1 | 54530 | 85.21 | 1 | 57867 | 82.52 | 1 | 281355 | 86.67 | 1 |
| | | TEUs | 4162 | 89.54 | | 4467 | 90.01 | | 4491 | 88.79 | | 4500 | 87.14 | | 4834 | 84.85 | | 22454 | 87.95 | |
| 6 | KANDLA | Tonnage | 452 | 0.73 | 4 | 0 | 0.00 | 6 | 56 | 0.09 | 6 | 175 | 0.27 | 6 | 1838 | 2.62 | 3 | 2521 | 0.78 | 5 |
| | | TEUs | 30 | 0.65 | | 0 | 0.00 | | 3 | 0.06 | | 5 | 0.10 | | 118 | 2.07 | | 156 | 0.61 | |
| WEST PORTS | | Tonnage | 61904 | 100.00 | | 63955 | 100.00 | | 64656 | 100.00 | | 63997 | 100.00 | | 70121 | 100.00 | | 324633 | 100.00 | |
| | | TEUs | 4648 | 100.00 | | 4963 | 100.00 | | 5058 | 100.00 | | 5164 | 100.00 | | 5697 | 100.00 | | 25530 | 100.00 | |

Source: Ministry of Shipping (<http://shipmin.gov.in>)

Comparing with the previous year (2013-14) the traffic handled in 2014-15 is increased to 3.3%. Comparing with the previous year (2014-15) the traffic handled in 2015-16 is increased to 1.1%. Comparing with the previous year (2015-16) the traffic handled in 2016-17 is decreased to 1.0%. Comparing with the previous year (2016-17) the traffic handled in 2017-18 is increased to 9.6%.

Hence the traffic handled at Eastern cost has increased for the last five years on average 3.2%.

Graphical Representation of Container Traffic Handled at Eastern Ports for F.Y. 2013-14 to 2017-18

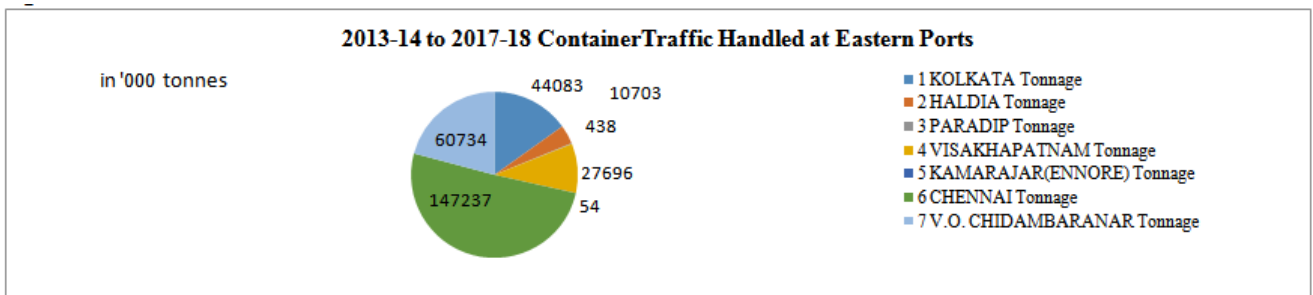


Figure 1

At Eastern Ports last five years Chennai Port Container handled a maximum percentage of 50.61 % and minimum percentage of 0.02 % by Ennore Port of total traffic handled.

Graphical Representation of Container Traffic Handled at Western Ports for F.Y. 2013-14 to 2017-18

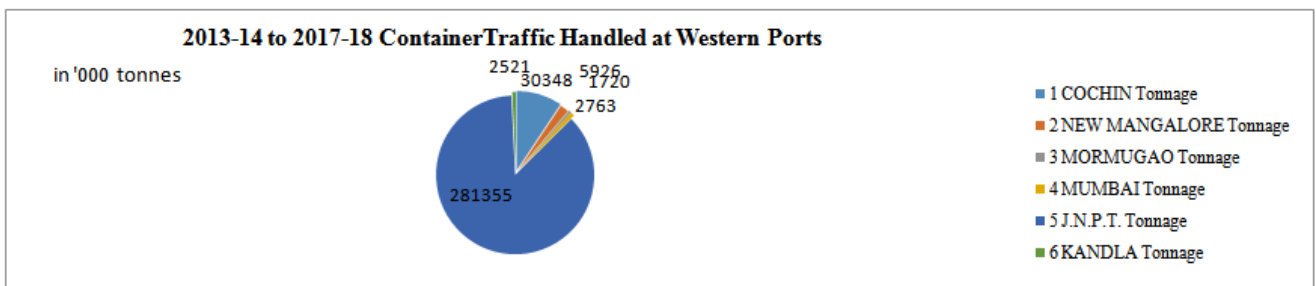


Figure 2

At Western Ports last five years, J.N.P.T Port Container handled a maximum percentage of 86.67 % and minimum percentage of 0.53 % by MormugaoPort of total traffic handled.

Table 3: Container Traffic Handled at All Major Ports for F.Y. 2013-14 to 2017-18 (in 000 tonnes, TEUs)

| Sl. No | PORT | Unit | 2013-2014 | | | 2014-2015 | | | 2015-2016 | | | 2016-2017 | | | 2017-2018 | | | TOTAL | | |
|--------|--------------------|---------|-----------|-------|------|-----------|-------|------|-----------|-------|------|-----------|-------|------|-----------|-------|------|---------|-------|------|
| | | | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank |
| 1 | KOLKATA | Tonnage | 7063 | 6.16 | 4 | 8110 | 6.79 | 4 | 9263 | 7.52 | 4 | 9887 | 7.93 | 4 | 9760 | 7.30 | 4 | 44083 | 7.16 | 4 |
| | | TEUs | 449 | 6.02 | | 528 | 6.64 | | 578 | 7.09 | | 636 | 7.53 | | 640 | 7.00 | | 2831 | 6.88 | |
| 2 | HALDIA | Tonnage | 2230 | 1.94 | 7 | 1958 | 1.64 | 7 | 1376 | 1.12 | 7 | 2467 | 1.98 | 7 | 2672 | 2.00 | 7 | 10703 | 1.74 | 7 |
| | | TEUs | 113 | 1.52 | | 102 | 1.28 | | 85 | 1.04 | | 136 | 1.61 | | 156 | 1.71 | | 592 | 1.44 | |
| 3 | PARADIP | Tonnage | 99 | 0.09 | 12 | 67 | 0.06 | 11 | 132 | 0.11 | 11 | 42 | 0.03 | 12 | 98 | 0.07 | 12 | 438 | 0.07 | 12 |
| | | TEUs | 9 | 0.12 | | 4 | 0.05 | | 5 | 0.06 | | 2 | 0.02 | | 7 | 0.08 | | 27 | 0.07 | |
| 4 | VISAKHAPATNAM | Tonnage | 4916 | 4.29 | 5 | 4372 | 3.66 | 6 | 5145 | 4.18 | 6 | 6428 | 5.16 | 6 | 6835 | 5.11 | 6 | 27696 | 4.50 | 6 |
| | | TEUs | 262 | 3.51 | | 248 | 3.12 | | 245 | 3.01 | | 367 | 4.35 | | 389 | 4.26 | | 1511 | 3.67 | |
| 5 | KAMARAJAR (ENNORE) | Tonnage | 0 | 0.00 | 13 | 0 | 0.00 | 12 | 1 | 0.00 | 13 | 1 | 0.00 | 13 | 52 | 0.04 | 13 | 54 | 0.01 | 13 |
| | | TEUs | 0 | 0.00 | | 0 | 0.00 | | 0 | 0.00 | | 0 | 0.00 | | 3 | 0.03 | | 3 | 0.01 | |
| 6 | CHENNAI | Tonnage | 28330 | 24.71 | 2 | 29945 | 25.07 | 2 | 30207 | 24.53 | 2 | 28850 | 23.14 | 2 | 29905 | 22.38 | 2 | 147237 | 23.92 | 2 |
| | | TEUs | 1468 | 19.69 | | 1552 | 19.50 | | 1565 | 19.21 | | 1495 | 17.71 | | 1549 | 16.95 | | 7629 | 18.54 | |
| 7 | V.O. CHIDAMBARANAR | Tonnage | 10129 | 8.83 | 3 | 11034 | 9.24 | 3 | 12388 | 10.06 | 3 | 12991 | 10.42 | 3 | 14192 | 10.62 | 3 | 60734 | 9.87 | 3 |
| | | TEUs | 508 | 6.81 | | 560 | 7.04 | | 612 | 7.51 | | 642 | 7.60 | | 698 | 7.64 | | 3020 | 7.34 | |
| 8 | COCHIN | Tonnage | 4785 | 4.17 | 6 | 5246 | 4.39 | 5 | 5785 | 4.70 | 5 | 6840 | 5.49 | 5 | 7692 | 5.76 | 5 | 30348 | 4.93 | 5 |
| | | TEUs | 347 | 4.65 | | 366 | 4.60 | | 419 | 5.14 | | 491 | 5.82 | | 556 | 6.08 | | 2179 | 5.30 | |
| 9 | NEW MANGALORE | Tonnage | 747 | 0.65 | 8 | 920 | 0.77 | 8 | 1105 | 0.90 | 8 | 1411 | 1.13 | 8 | 1743 | 1.30 | 9 | 5926 | 0.96 | 8 |

Source: Ministry of Shipping (<http://shipmin.gov.in>)

Comparing with the previous year (2013-14) the traffic handled in 2014-15 is increased to 4.2%. Comparing with the previous year (2014-15) the traffic handled in 2015-16 is increased to 3.1%. Comparing with the previous year (2015-16) the traffic handled in 2016-17 is decreased to 1.2%. Comparing with the previous year (2016-17) the traffic handled in 2017-18 is increased to 7.2%.

Hence the traffic handled at Eastern cost has increased for the last five years on average 3.9%.

Graphical Representation of Container Traffic Handled at All Major Ports for F.Y. 2013-14 to 2017-18

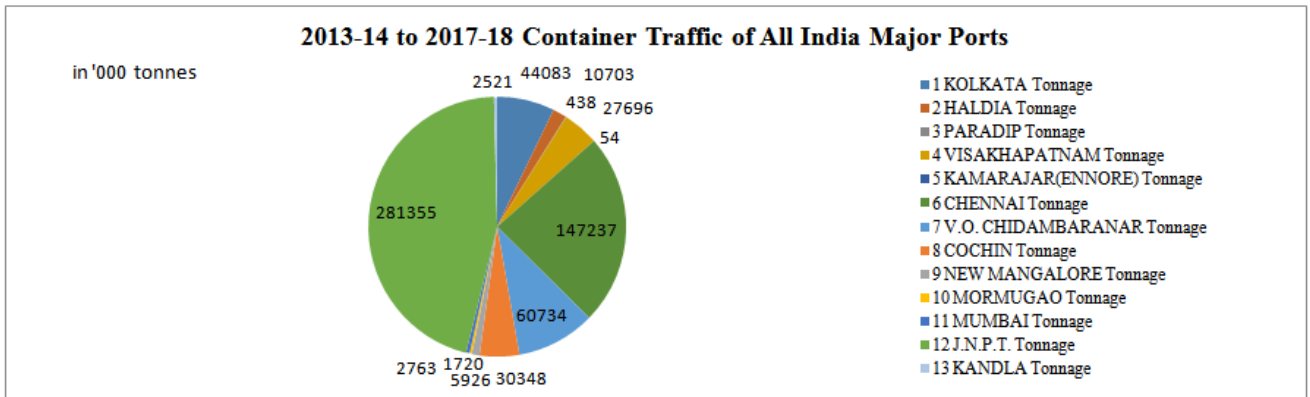


Figure 3

In India Major Ports Container handled in last five years maximum percentage handled by J.N.P.T Port 86.67 % and minimum percentage handled by EnnorePort 0.01% of total traffic handled.

Table 4: Comparison of Container Traffic Handled at East & West Ports for F.Y. 2013-14 to 2017-18 (in 000 tonnes, TEUs)

| Sl. No | PORTS | Unit | 2013-2014 | | | 2014-2015 | | | 2015-2016 | | | 2016-2017 | | | 2017-2018 | | | TOTAL | | |
|--------|------------|---------|-----------|--------|------|-----------|--------|------|-----------|--------|------|-----------|--------|------|-----------|--------|------|---------|--------|------|
| | | | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank | Traffic | % | Rank |
| 1 | EAST PORTS | Tonnage | 52767 | 46.02 | 2 | 55486 | 46.45 | 2 | 58512 | 47.51 | 2 | 60666 | 48.66 | 2 | 63514 | 47.53 | 2 | 290945 | 47.26 | 2 |
| | | TEUs | 2809 | 37.67 | | 2994 | 37.63 | | 3090 | 37.92 | | 3278 | 38.83 | | 3442 | 37.66 | | 15613 | 37.95 | |
| 2 | WEST PORTS | Tonnage | 61904 | 53.98 | 1 | 63955 | 53.55 | 1 | 64656 | 52.49 | 1 | 63997 | 51.34 | 1 | 70121 | 52.47 | 1 | 324633 | 52.74 | 1 |
| | | TEUs | 4648 | 62.33 | | 4963 | 62.37 | | 5058 | 62.08 | | 5164 | 61.17 | | 5697 | 62.34 | | 25530 | 62.05 | |
| TOTAL | | Tonnage | 114671 | 100.00 | | 119441 | 100.00 | | 123168 | 100.00 | | 124663 | 100.00 | | 133635 | 100.00 | | 615578 | 100.00 | |
| | | TEUs | 7457 | 100.00 | | 7957 | 100.00 | | 8148 | 100.00 | | 8442 | 100.00 | | 9139 | 100.00 | | 41143 | 100.00 | |

Source: Ministry of Shipping (<http://shipmin.gov.in>)

In India 2013-14 to 2017-18 Western Ports handled 33688 MT more compared to Eastern Ports.

Graphical Representation of Container Traffic Handled at East & West for F.Y. 2013-14 to 2017-18

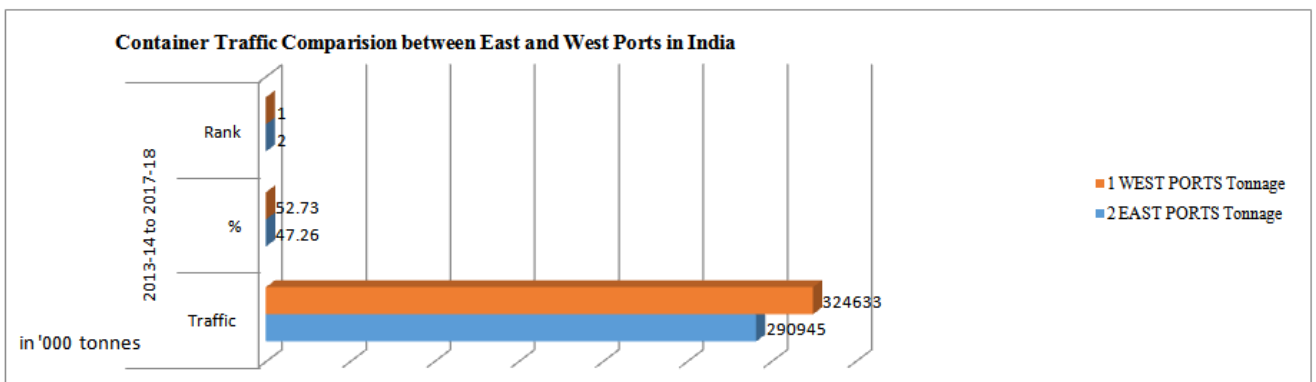


Figure 4

In India 2013-14 to 2017-18 Western Ports handled 5.48% more compared to Eastern Ports

RESULTS AND DISCUSSIONS

There are limited studies using operational performance indicator in the Indian scenario regarding ports. The most recent such study (Deshmukh, 2011) employs descriptive statistics for inter-comparison of port performances. The present study improves upon this by first ensuring consistency amongst the operational parameters as discussed in the previous section and devising a CPI that present a holistic performance of port operations. The limitation of this study is that it can only explain major discrepancies amongst the ports.

- Indian Container port traffic has grown by 7.2 % in 2017-18, following -1.2 % decreased in 2016-17.
- Indian Major Ports have significant growth of container traffic during the last five years i.e., 2013-14 to 2017-18
- Major commodities exported from India are RMG (Readymade Garments) / Textiles, Chemicals, Steel Products, food products, Fabric/Yarn, Pharmaceuticals and others.
- Major commodities imported by India are electric and electronics goods, Machinery/spares, Chemical, Steel Products, Polymer/ Polymer products, and others.
- Indian Container handling at major ports and multi-mode transport increasing year by year. For coming years it is going to increase more than 10% every year due to Indian export and import global trade.

REFERENCES

1. Kasypi, M. and Muhammad, Z.S. (2006) 'A regression model for vessel turnaround time', Tokyo Academic, Industry & Cultural Integration Tour, December.
2. Lee, S.W. and Kim, C.H. (2006) 'Performance evaluation of Asian port distriparks using factor analysis', Ocean Policy Research, Vol. 21, No. 1, pp.52–82. Marlow,
3. P.B. and PaixaoCasacao, A.C. (2003) 'Measuring lean ports performance', International Journal of Transport Management, Vol. 1, No. 4, pp.189–202.
4. Ministry of Shipping (MoS) (2010) Performance Audit of Functioning of Major Port Trust in India, Report No. 3 of 2009–2010, Chapter V, pp.1–15.
5. Ministry of Shipping (MoS) (2014) [online] <http://www.shipping.nic.in> (accessed 4 December 2014).
6. Puiga, M., Wooldridgeb, C. and Darbraa, R.M. (2014) 'Identification and selection of environmental performance indicators for sustainable port development', Marine Pollution Bulletin, Vol. 81, No. 1, pp.124–130.
7. Saaty, T.L. (1980) *The Analytic Hierarchy Process*, McGraw Hill International, New York. Sanchez, R.J., Hoffmann, J., Micco, A., Pizzolitto, G.V., Sgut, M. and Wilmsmeier, G. (2003) 'Port efficiency and international trade: port efficiency as a determinant of maritime transport costs', Maritime Economics and Logistics, Vol. 5, No. 2, pp.199–218.
8. Trujillo, L. and Nombela, G. (1999) *Privatisation and Regulation of the Seaport*, Industry Policy Working Paper 2181, World Bank, Washington DC.
9. UNCTAD (1976) *Port Performance Indicators*, United Nations, New York UNCTAD (2013) *Review of Maritime Transport*, United Nations, Geneva.

10. *Ministry of Shipping* - <http://shipmin.gov.in>

11. *Indian Port Association* - <http://www.ipa.nic.in/>