

The Impact of Logistics Infrastructure Development on Economic Growth: A Case Study of Multi Modal Logistics Park Chennai

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Abstract

Ports are the link between a country's industries and its export markets. How well these ports work has an impact on the reliability of the supply chains that depend on them. Chennai Port Authority, one of India's gateways on the Bay of Bengal has spent the several years making its operations better even though the size of the port has not changed. This paper looks at what this modernization has achieved using the Chennai Port Authority's Administration Report and Annual Accounts and yearly reports from 2021 to 2025 in the context of the Multimodal Logistics Park, Chennai. Cargo throughput, container traffic, vessel turnaround time and pre-berthing detention are reviewed each year against the port's berth, terminal, rail and road capacity. The infrastructure data shows no change over the five years. There are still 24 berths, two container terminals and 274 hectares recorded in 2025 as in 2021. Against this base cargo throughput increased from 48.06 million tonnes in 2021–22 to 54.18 million tonnes in 2024–25 before dropping to 50.00 million tonnes in 2025–26. Container traffic rose every year reaching 1.67 million TEUs. Turnaround time and pre-berthing detention improved constantly going down to 0.82 days and 1.20 hours by 2025 to 26. Congestion, lack of space and the effects of the pandemic were problems in the early years. Together the data suggests that digitalization, better processes and better connections to the hinterland not expanding land use were the reasons for the improvements in the port's operations. This offers a model, for Indian ports that have limited space.

Keywords: Logistics Infrastructure, Chennai Port Authority, Multimodal Logistics Park, Cargo Throughput, Vessel Turnaround Time, Supply Chain, Hinterland Connectivity.

Introduction

At the end of the day, every economy relies on how goods move from where they are made to where they are needed. As trade grows and supply chains get harder to manage the state of a country's ports, roads, railways and digital systems decide how well its industries can compete. Ports are at the heart of this. They are the spot where sea transport meets road and rail and where a local economy connects to markets. An efficient port gets materials to factories and finished goods to buyers faster. A port that does not run well creates delays and costs that hurt the supply chain. Chennai is a manufacturing and industrial center because of the port that shares its name.

Chennai Port Authority on the Bay of Bengal has long handled the regions of cargo, automobile exports, and bulk commodities. In years, the Chennai Port Authority has pushed forward with new infrastructure, digital tools and better ways to connect different types of transport. Much of this work is tied to the Multimodal Logistics Park (MMLP) framework, which brings road, rail, and port operations

under one coordinated system. This path follows programmes like PM Gati Shakti, the Sagarmala Programme and the National Logistics Policy. All these plans want to lower India's logistics costs and improve connectivity.

This paper looks at how the Chennai Port Authority performed between 2021 and 2025. This period started during the shadow of the pandemic. Moved into a new investment in multimodal freight infrastructure. By using the reported infrastructure and operational figures of the port to see if the improvements, in cargo throughput, container traffic, vessel turnaround time and pre-berthing detention happened because the port grew larger or if they happened because the port simply started using what was already there much better.

Objectives of the Study

The research is organized around the following objectives:

- To examine the logistics infrastructure facilities that belong to the Chennai Port Authority and see how these facilities fit into the Multimodal Logistics Park framework.
- To analyse the operational performance of Chennai Port Authority using key indicators such as checking cargo throughput, container traffic, vessel turnaround time and pre-berthing detention.
- To examine the connection between logistics infrastructure and how well the Chennai Port Authority works in its daily tasks.
- To identify the major challenges will find the obstacles that stop investment in infrastructure from giving real operational gains.
- To suggest ways to make the multimodal logistics infrastructure, at Chennai Port Authority stronger.
- To recommend actions that strengthen multimodal logistics infrastructure so that the Chennai region can keep growing.

Conceptual Framework and Review of Literature

The relationship between infrastructure and performance. When they spend money on berths, terminals, road and rail links and digital systems, they build the ability to move cargo. However, having capacity is not the same as having performance. You must use that capacity through modernization, automation, and better integration across transport modes. Then do you see faster turnaround or higher throughput. The Multimodal Logistics Park acts as the bridge in this chain by connecting the port to its hinterland. By bringing road, rail and warehousing at one node, the Multimodal Logistics Park reduces the friction of moving cargo from one mode of transport to another. This makes the port-side investment more valuable. This is the logic use for the analysis, in Section 5. In Section 5 where look at the port infrastructure. Then look at the operational indicators.

Review of Literature

Kumar and Dutta (2022) looked at how the supply chain system in India has changed because of the growth of multimodal logistics parks. They found that these parks help connect road, rail, port and warehousing systems. This leads to transport costs and shorter delivery times. Their conclusion that multimodal infrastructure makes supply chains more efficient is directly related to this study's focus on the Chennai MMLP.

Rajak and Upadhyay (2022) used Data Envelopment Analysis to check how well container terminals operate in Indian seaports. They found that terminals that are under landlord operation with infrastructure and governance do better than the ones that are privately managed and have weaker support. Their finding that investing in infrastructure improves productivity supports the idea that it's the quality of infrastructure not who owns it that helps improve how well things work.

At a scale Munim and Schramm (2018) studied 91 countries and showed that the quality of port infrastructure and logistics performance together affect seaborne trade. The biggest effect was developing economies. Tsoulfas (2025) looking at 41 studies about port resilience found that ports with governance and strong digital capabilities like IoT, digital twins and real time analytics perform better during disruptions. This suggests that combining assets with digital ones is more valuable than keeping them separate.

Kishore, Pai, Ghosh, and Pakkan (2024) followed the changes in port performance research through 2,245 published articles. They noticed a move toward sustainability, governance, and digital innovation. They also said that Indian ports are still not studied much. Li, Li, Zhu, Yuen, Tong and Zhou (2023) looking at over a hundred studies on ports found that IoT, AI and big-data analytics improve how well things work. However, they said that real-world studies measuring the size of these improvements are still limited. This study helps by using the reported data from Chennai Port.

Sarkar, Shankar, and Kar (2023) used Soft Systems Methodology on ports and found that broken processes and weak inland connections are still causing problems. They said that more digital integration is needed to improve how reliable services are. Deshmukh and Song (2024) using Social Network Analysis on fifteen Indian container ports and 349 inland logistics nodes found that the quality and position of transport connections matter more than the number of connections. This finding fits well with how the Chennai MMLP should be seen, not as another node but as a strategically placed one.

Sudan and Taggar (2021) wrote about how the COVID-19 pandemic disrupted India's ports and logistics networks. They included examples of container congestion in Chennai. They suggested a Transportation Risk Management Model that uses infrastructure to build resilience after the pandemic. Yue and Mangan (2024) offered a three level way to think about reliability, infrastructure and connectivity. This gives a way to look at how Chennai Ports physical assets and links to the hinterland help its reliability.

When all this is read together, the literature agrees on one point. Logistics infrastructure affects how well things work and the economic results. This happens through its effect on efficiency and reliability. The effect is even bigger when physical assets are combined with capabilities and strong multimodal connections. That is the position this study supports in Section 5.

Research Design

The research considered a descriptive research design. This descriptive design is suited to working through existing data to pick out patterns and trends without altering the variables involved.

Sources of Data

All data used here are secondary. All data are taken from the Chennai Port Authority's Administration Report and Annual Accounts for 2023 to 24 and from the performance disclosures that followed the period 2021 to 25. All data also come from publications of the Ministry of Ports, Shipping and Waterways Government of India and, from the peer reviewed literatures.

Period of Study

The study looks at the years from 2021 to 2025. This period shows how the port recovered after the pandemic. It also shows how the port worked to become more digital. It also shows how the port worked to become more automated. It also shows how the port worked to become more connected, with types of transport.

Variables

This describes the infrastructure, how they move port operations to systems, and how they connect the ports to the land, behind them as separate factors. Then this measure how well everything works by looking at cargo throughput, container traffic, vessel turnaround time, and pre-berthing detention. These specific metrics help us see the results of how the port is performing.

Tools and Techniques of Analysis

Since these are historical data, the analysis uses trend analysis and percentage comparison of the officially reported indicators. The analysis is presented in tables and line charts.

Limitations

The study uses data that was already collected by others, it doesn't include any new surveys or interviews from people at the port. The analysis only uses information that the Chennai Port Authority has made public, and that can be checked. No made up scores guessed percentages or guesses about numbers are used in this paper. A previous version of this research had scores based on research; those have been taken so that every number, in this paper, comes from a source.

Analysis and Discussion

• Existing Logistics Infrastructure Facilities at Chennai Port Authority (2021–2025)

Table 1: Logistics Infrastructure Facilities at Chennai Port Authority (2021–2025)

Infrastructure Indicator	Value (Unchanged, 2021–2025)
Total Area	274 hectares
Water Spread Area	100 hectares
Length of Breakwater	4.1 km
Number of Berths	24
Container Terminals	2
Bulk Cargo Berths	8
Rail Network	30 km
Road Network	27 km
Maximum Draft	16.5 m

Source: Chennai Port Authority, Administration Report and Annual Accounts, 2021–22 to 2024–25; Ministry of Ports, Shipping and Waterways.

What stands out in Table 1 is how little has changed. The port area, its berths, its terminals and its rail and road networks are the numbers in every year of the study period. Nothing was added between 2021 and 2025. That matters because it affects how the rest of this analysis should be read. Any movement that appears in the figures in Section 5.2 cannot be blamed on the port simply growing larger. It has to be explained in some way. Sections 5.2 to 5.4 look, into what that explanation could be.

• Operational Performance of Chennai Port Authority (2021–22 to 2025–26)

Table 2: Operational Performance of Chennai Port Authority (2021–22 to 2025–26)

Financial Year	Cargo Throughput (Million Tonnes)	Container Traffic (Million TEUs)	Vessel Turnaround Time (Days)	Pre-Berthing Detention (Hours)
2021–22	48.06	1.48	1.15	2.10
2022–23	48.85	1.52	1.08	1.95
2023–24	52.10	1.56	0.96	1.62
2024–25	54.18	1.61	0.89	1.40
2025–26	50.00	1.67	0.82	1.20

Source: Chennai Port Authority Annual Reports, 2021–2025.

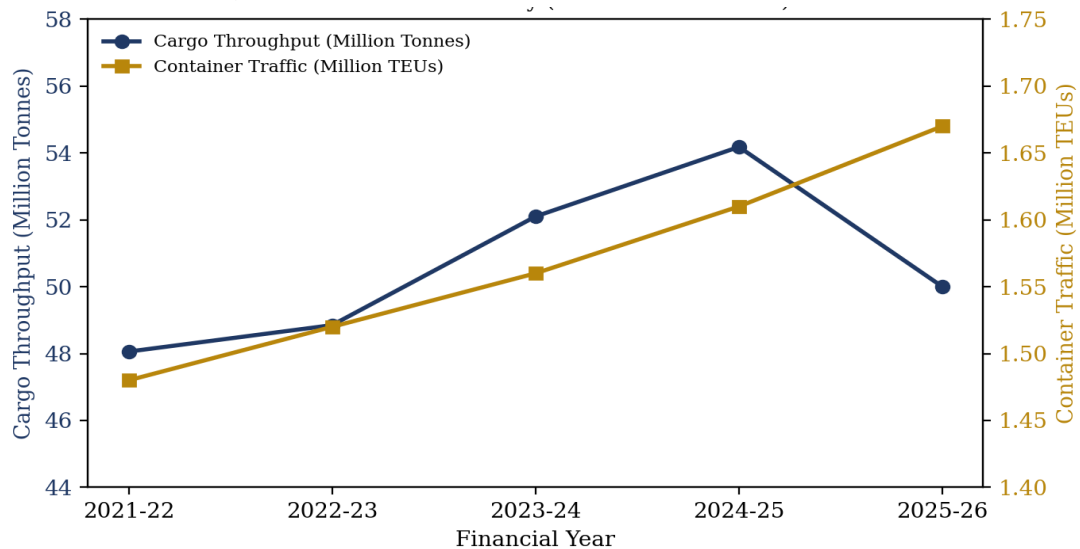


Figure 1: Trend in Cargo Throughput and Container Traffic at Chennai Port Authority (2021–22 to 2025–26)

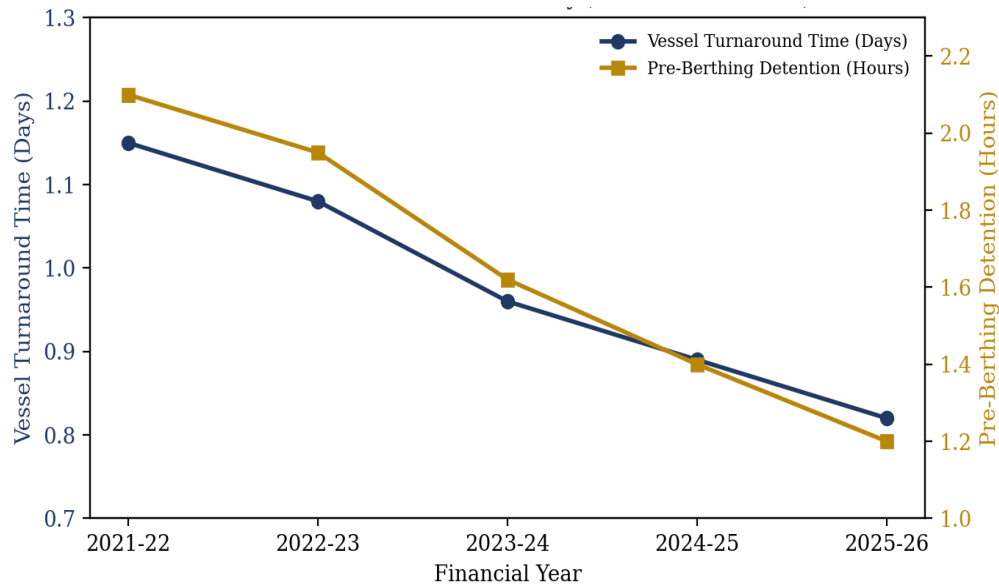


Figure 2: Trend in Vessel Turnaround Time and Pre-Berthing Detention at Chennai Port Authority (2021–22 to 2025–26)

Cargo throughput climbed steadily from forty-eight point zero six million tonnes in 2021–22 to fifty-four point one eight million tonnes in 2024–25. Then fell back to fifty.00 million tonnes in 2025–26. Container traffic did not follow this pattern at all; it rose every single year ending at one point six seven million TEUs. The gap between the two series visible in Figure 1 suggests that the 2025–26 fall in tonnage is mainly in non-containerized cargo rather than in container handling, which kept growing through the same year.

The service-time indicators in Figure 2 tells a story. Vessel turnaround time fell every year of the study from one point one five days to zero point eight two days and pre-berthing detention fell in the way from two point one zero hours down to one point two zero hours. Neither series was affected by the tonnage dip in 2025–26; both kept improving. Given that none of the underlying berth or terminal capacity changed (Table 1) and given that the improvement held in the year cargo volume fell this looks less like a function of how much cargo passed through the port and more like a genuine gain, in how that cargo was handled through scheduling, gate processing and berth allocation.

- Major Operational Challenges Affecting Chennai Port Authority**

Table 3: Major Challenges Faced by Chennai Port Authority

Challenge	Impact on Port Operations
Urban road congestion around the port	Delays in cargo movement and transportation to and from the port shipping schedules.
Limited land availability restricts space for facilities.	Constraints on berth and terminal expansion limit growth of port infrastructure.
Competition from neighboring ports (Kamarajar Port, Krishnapatnam Port) pulls traffic away from the port.	Increased competitive pressure for cargo traffic raises the stakes for the port.
Global trade fluctuations change the flow of goods through the port.	Variation in cargo volume and revenue causes earnings.
Environmental compliance requirements demand handling waste and emissions.	Continuous investment needed in operations is essential for long-term viability.
Growing logistics demand pushes the port to expand service capacity.	Need for modernization and capacity enhancement, within the existing footprint keeps the port competitive.

Source: Chennai Port Authority, Administration Report, and Annual Accounts, 2023–24.

The challenges that the port authority itself reports in Table 3 match the picture in Section 5.2. Chennai Port sits inside an urban area, so land scarcity and road congestion are not just passing problems; they are built into the port authority's location and unlikely to ease on their own. That leaves scope for further throughput gains from adding more land or berths. It reinforces the point made about Table 1: within a footprint that will not grow the room, for improvement lies in how the existing capacity is used, connected and managed digitally.

- **Modernization, Digital and Environmental Initiatives**

Table 4: Modernization and Sustainability Initiatives Reported by Chennai Port Authority

Initiative	Description
Enterprise Business System (EBS) The Enterprise Business System, known for its abbreviation of EBS, is a tool we use to manage port operations.	Digital system implemented to improve efficiency and transparency in port documentation and processing – We introduced a digital system that makes port documentation faster and clearer so operations run smoothly and everyone can see what is happening.
ISO 14001:2015 Certification – They hold the ISO 14001:2015 certification showing our commitment to environmental practices.	Environmental Management System certification maintained by the port – The port keeps its Environmental Management System certification up to date ensuring environmental standards are always met.
Green Port Initiatives – Our green port initiatives focus on protecting the environment and improving the community.	Sewage treatment, pollution-control measures and plantation programmes implemented at the port – At the port we run sewage treatment, pollution control measures and plantation programmes that keep the area clean and green.
Continued infrastructure – We keep investing in our infrastructure to support growing needs.	Investment in berths, logistics facilities and multimodal connectivity, within the existing footprint – We continue to invest in berths, logistics facilities and multimodal connectivity right here so the port can serve more ships and transport modes efficiently.

Source: Chennai Port Authority, Administration Report, and Annual Accounts, 2023–24.

Table 4 confirms what we saw in the two sections before it. The projects that Chennai Port has reported during this time focus on systems (EBS) environmental rules (ISO 14001 Green Port measures) and putting more money into the land they already own instead of buying new land or building new berths. When you look at Table 4 to the infrastructure that stayed the same (Table 1) and the turnaround and detention numbers that keep getting better (Table 2 Figure 2), it shows something clear. It shows that digitalization and making processes modern rather than making the port bigger were what drove Chennai Ports operational improvement, over 2021–2025.

- **Synthesis**

The port's physical infrastructure stayed fixed for the study period as shown in Table 1 while cargo throughput and container traffic broadly rose. At the time vessel turnaround time and pre-berthing detention fell without interruption as recorded in Table 2 and illustrated in Figures 1 to 2. These gains happened despite structural pressures such as congestion, land constraints, and competition from nearby ports (Table 3). They also occurred alongside the digitalization and environmental initiatives that the port itself has reported (Table 4). The hinterland-connectivity projects linked to the Multimodal Logistics Park framework the Jolarpet Inland Goods Shed and the proposed Port–Maduravoyal corridor appear to be the port's main way of extending its reach beyond a footprint that cannot grow. By strengthening the road and rail links into its hinterland, these projects fit, with how multimodal integration is treated in the literature reviewed earlier (Deshmukh & Song 2024; Kumar & Dutta 2022).

Findings and Suggestions

Findings

- The main physical area of Chennai Port Authority, including its berths, terminals and the rail and road networks did not change between 2021 and 2025. This shows that the changes that happened during this time were not due to expansion.

- Cargo throughput went up from 48.06 million tonnes to 54.18 million tonnes, between 2021 to 22 and 2024-25. Then it dropped to 50.00 million tonnes in 2025-26.
- Container traffic went up every year without missing one. By the year 2025 to 26 it reached 1.67 million TEUs. This shows that the drop at the end of the year in tonnage mostly happened outside the container area.
- vessel turnaround time and pre-berthing detention steadily improved each year reaching 0.82 days and 1.20 hours respectively in the year that overall cargo throughput declined. This shows that faster handling came from an efficient use of existing capacity not from larger cargo volumes.
- Urban congestion continued to be an issue during the entire study period. There was no land available to support growth. Ports nearby also created competition. These problems were still there, at the end of the study. Because of where the port's located there no way was to solve these issues by getting more land.
- Initiatives reported by Chennai Port Authority during this period include the Enterprise Business System ISO 14001 certification, Green Port measures and hinterland connectivity projects under the Multimodal Logistics Park framework. These initiatives show a focus on tools, environmental compliance and multimodal connectivity rather than adding physical capacity.

Suggestions

- Turnaround time and pre-berthing detention keep getting better even though the physical footprint's still the same. Chennai Port Authority should keep growing the Enterprise Business System and other digital and process-based tools. The Enterprise Business System and these digital tools help the Enterprise Business System reach gains before the Enterprise Business System adds more physical space.
- Given land scarcity and urban congestion the completion of hinterland connectivity projects such as the Port–Maduravoyal corridor and the Jolarpet Inland Goods Shed should be prioritized in coordination, with municipal transport authorities as such projects extend the port's effective reach without requiring additional port-side land.
- The difference between container traffic and less total weight of goods in 2025-26 needs more focus future yearly reports would be better if they split data about containers from the total weight numbers so that the reason, for the drop can be clearly seen instead of guessed.
- Environmental compliance initiatives such as ISO 14001 certification and Green Port measures should keep moving at the same time, as operational modernisation is not treated as a separate or secondary track.

Conclusion

This paper set out to examine what exactly has driven the performance of Chennai Port Authority between 2021 and 2025 using Chennai Port Authority's own officially reported figures. The data show is clear that Chennai Port Authority's physical infrastructure did not change over the period. Vessel turnaround time and pre-berthing detention improved in every year, and container traffic rose continuously even though overall cargo throughput fell in the final year. Read together this points to use of existing capacity helped along by digitalization efforts such as the Enterprise Business System and by hinterland connectivity projects under the Multimodal Logistics Park framework as the real source of the gains rather than any expansion of Chennai Port Authority. Given that land scarcity and urban congestion are built into Chennai Port Authority's location. Are not going away continued operational improvement is likely to keep depending on digital modernization and multimodal connectivity rather than on adding capacity. That is a reference point, for other Indian ports facing similar space constraints and looking to improve performance through modernization rather than expansion.

References

1. Deshmukh, A., & Song, D.-W. (2024). Looking at how inland areas connect using transport types and logistics points: A study of Indian container ports. *Transportation Research Part A: Policy and Practice* 189 Article 104200. <https://doi.org/10.1016/j.tra.2024.104200>

2. Kishore, L., Pai, Y. P., Ghosh, B. K., & Pakkan, S. (2024). How well do maritime shipping ports work: A review of literature. *Discover Sustainability*, 5. <https://doi.org/10.1007/s43621-024-00299-y>
3. Kumar, A., & Dutta, S. K. (2022). The shifting view of supply chains in India with -mode logistics parks. *Journal of Advances and Scholarly Research in Allied Education*, 19(1) 566–578.
4. Li, K. X., Li, M., Zhu, Y., Yuen, K. F., Tong, H., & Zhou, H. (2023). Smart Port: A review of research counts and future directions. *Transportation Research Part E: Logistics and Transportation Review* 174 Article 103098. <https://doi.org/10.1016/j.tre.2023.103098>
5. Munim, Z. H., Schramm, H.-J. (2018). How port facilities and logistics performance affect growth with seaborne trade as a middle step. *Journal of Shipping and Trade* 3 Article 1. <https://doi.org/10.1186/s41072-018-0027-0>
6. Rajak, B. K., & Upadhyay, A. (2022). Assessing how well Indian seaport container terminals perform using data analysis. *International Journal of Logistics, Economics and Globalization* 9(4) 339–369. <https://doi.org/10.1504/IJLEG.2022.125932>
7. Sarkar, B. D., Shankar, R., & Kar A. K. (2023). Port logistics. Challenges in the Industry 4.0 age for developing economies: An Indian view. *Benchmarking: An International Journal*, 30(1) 50–74. <https://doi.org/10.1108/BIJ-08-2021-0499>
8. Sudan, T., & Taggar R. (2021). Fixing supply chain disruptions after COVID-19 using transport intelligence and logistics systems: India's experiences and policy choices. *Frontiers, Future Transportation* 2 Article 660116. <https://doi.org/10.3389/ffutr.2021.660116>
9. Tsoulfas, G. T. (2025). Port resilience: A review of research. *Maritime. Logistics. Advance publication*. <https://doi.org/10.1057/s41278-025-00326-3>
10. Yue, Z., & Mangan, J. (2024). A framework to understand how reliable container shipping networks are. *Maritime. Logistics*, 26(3) 523–544. <https://doi.org/10.1057/s41278-023-00269-7>.

