

**“A STUDY ON CONTAINER SHORTAGE AND SUPPLY
CHAIN DISRUPTIONS – CAUSES AND MITIGATION
STRATEGIES”**

Project report submitted to the School of Maritime Management, Indian Maritime
University in partial fulfilment for the requirements for the award of degree of

MASTER OF BUSINESS ADMINISTRATION

In

PORT AND SHIPPING MANAGEMENT

Submitted by

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DECLARATION

I, SALMANUL FARIS EK, Reg. No.2303304028 student of School of Maritime Management, Indian Maritime University, pursuing MBA in Port and Shipping Management hereby declare that this submission of this project report titled "A STUDY ON CONTAINER SHORTAGE AND SUPPLY CHAIN DISRUPTIONS – CAUSES AND MITIGATION STRATEGIES" - has been prepared by me towards the partial fulfilment of the Master of Business Administration in Port shipping Management under the supervision of Dr .Lekha Ravi Assistant Professor SMM, Indian Maritime University, Chennai Campus. I also declare that this project report is my original work and has not been copied from any other report previously submitted for the award of any degree, fellowship or other in the similar title.

Place: Chennai

Date: 27/05/2025



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This is to certify that project report entitled "A STUDY ON CONTAINER SHORTAGE AND SUPPLY CHAIN DISRUPTIONS – CAUSES AND MITIGATION STRATEGIES"-submitted to partial fulfillment of the requirement for awarding the degree, MBA in Port and Shipping management is genuine work of SALMANUL FARIS E K (Reg no.2303304028).



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ACKNOWLEDGEMENT

I extend my heartfelt thanks to Dr B Swaminathan, Head of SMM, Chennai Campus, for providing me with the facilities to carry out the project successfully.

With great pleasure, I express my sincere gratitude to Dr Lekha Ravi, Assistant Professor, School of Maritime Management, Indian Maritime University, Chennai Campus, for the valuable guidance and suggestions that enabled me to complete this report successfully.

In a special way, I submit my grateful thanks to my family, who motivated and encouraged me throughout the project period. I would like to profoundly thank all respondents who helped me in collecting the necessary information for the completion of this project.

Last but not least, my prayers and thanks to the “almighty” without whom the work would not have been materialized.

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ABSTRACT

The global maritime and logistics sector has experienced severe disruptions in recent years, with container shortages becoming a significant bottleneck to efficient trade and supply chain operations. This research investigates the causes of container shortages and their broader implications, while also exploring potential strategies to mitigate these disruptions. The study focuses primarily on the Indian logistics context, complemented by global perspectives, to present a comprehensive understanding of the issue. A mixed-methods research approach was employed, incorporating both primary and secondary data. Primary data was gathered through interactions with key stakeholders involved in shipping, logistics, and port operations, providing practical insights into the challenges and real-time responses within the supply chain ecosystem. Secondary data was obtained from academic literature, industry reports, government publications, and trade analyses to support and contextualize the findings. The study examines various interrelated causes of container shortages, such as global trade imbalances, inefficient repositioning practices, congestion at ports, limited domestic container production, and gaps in multimodal logistics infrastructure. It also considers the economic and operational consequences of these disruptions on trade efficiency, freight costs, and delivery schedules. Additionally, the research outlines strategies to reduce the frequency and impact of such shortages, highlighting the importance of infrastructure development, technology integration, improved coordination, and long-term planning. Overall, the study provides valuable recommendations for building a more resilient and self-sufficient logistics framework in India, contributing to enhanced global trade participation and supply chain stability.

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CHAPTER 1
INTRODUCTION

1.1 THE CONTAINER INDUSTRY

The smooth flow of commodities over international borders is made possible by the container business, which is an essential part of global trade. By standardizing freight handling, cutting shipping costs, and boosting efficiency, it has completely changed logistics. Containerization makes it possible for products to be moved quickly and safely using a variety of transportation methods, such as trucks, trains, and ships.

Globalization, which has greatly raised the need for containerized shipping, is intimately related to the expansion of the container industry. Port operators, shipping lines, and container leasing firms are some of the major participants in the business. Global commerce hubs are connected by the massive fleets of container ships operated by industry leaders like Maersk Line, MSC, and COSCO. The advent of mega-ships with bigger capacities has improved economies of scale even more, increasing cost-effectiveness and competitiveness.

However, natural disasters, geopolitical unrest, and shifts in global demand can all have a significant impact on the container sector. Container shortages and congestion at major ports are the result of recent occurrences, including the COVID-19 epidemic, highlighting weaknesses in the global supply chain. Furthermore, empty container repositioning has become problematic due to regional trade imbalances, such as Asia's export supremacy and Europe's and North America's reliance on imports.

Technological developments and digitization are changing the container business sector. IoT-enabled smart containers offer real-time cargo tracking and monitoring, improving security and transparency. Additionally, blockchain technology is being used to expedite customs clearance procedures and enhance documentation. Sustainability has grown in importance as the sector develops, and shipping firms are purchasing environmentally friendly ships to cut carbon emissions and adhere to global environmental standards.

1.1.1 The Container Industry: Evolution, Impact, and Regional Growth

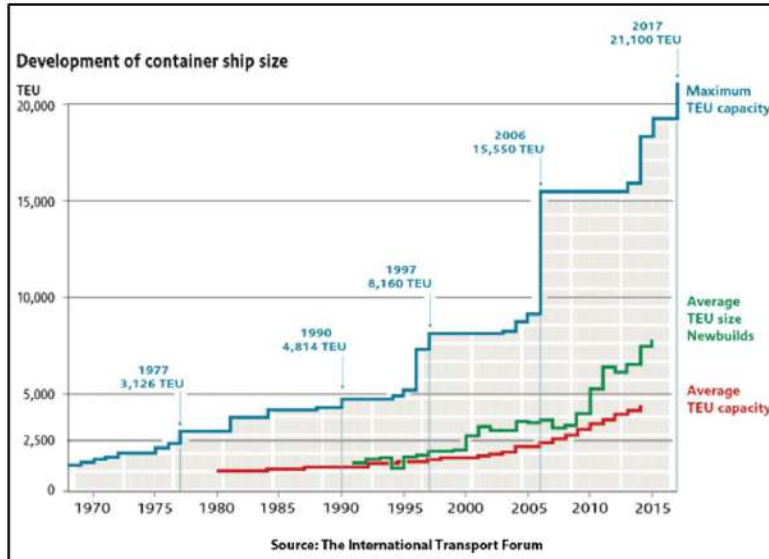
The container shipping industry stands as a cornerstone of global trade, revolutionizing the transportation of goods and fostering economic interconnectivity. This section of the study delves into the evolution of the container business, its profound impact on international commerce, and the regional growth patterns that have shaped its current landscape.

1.1.2 Evolution of the Shipping Container Industry

The inception of containerization in the mid-20th century marked a paradigm shift in maritime logistics. Prior to this innovation, cargo was manually loaded and unloaded in a labor-intensive and time-consuming process. The introduction of standardized containers streamlined these operations, significantly reducing handling times and costs. Malcolm McLean, often hailed as the father of containerization, pioneered the use of intermodal containers in the 1950s, facilitating seamless movement of goods across ships, trucks, and trains.

Over the decades, container ships have undergone remarkable transformations in size and capacity. The 1970s saw vessels capable of carrying approximately 1,500 Twenty-Foot Equivalent Units (TEUs). In contrast, modern ultra-large container vessels (ULCVs) boast capacities exceeding 23,000 TEUs, epitomized by ships like the MSC Gülsün. This escalation in vessel size has been driven by the pursuit of economies of scale, enabling shipping lines to transport more cargo per voyage and reduce per-unit costs.¹

Figure 1 Evolution of Container Ship size



Source: *Maritime Cyprus*

¹ <https://unctad.org/webflyer/review-maritime-transport-2022>

1.1.3 Impact on Global Trade

Containerization has been instrumental in propelling globalization, making it feasible to transport goods swiftly and efficiently across vast distances. This system has lowered trade barriers, reduced shipping costs, and expanded markets for producers and consumers alike. As of 2021, container ships were responsible for transporting approximately 1.95 billion metric tons of cargo globally, a substantial increase from the 100 million metric tons recorded in 1980. This surge underscores the critical role container shipping plays in facilitating international trade.

The economic impact of container shipping is profound. It has enabled just-in-time manufacturing, allowing companies to maintain lean inventories and respond promptly to market demands. Moreover, the accessibility to global markets has spurred economic growth in developing nations, integrating them into the world economy and fostering industrialization.

1.1.4 Regional Growth and Distribution

The expansion of container shipping has not been uniformed across the globe; instead, it reflects regional economic developments and trade dynamics.

Asia

Asia, particularly East Asia, has emerged as a dominant force in container shipping. Countries like China, South Korea, and Singapore host some of the world's busiest ports. For instance, the Port of Shanghai has consistently ranked as the world's busiest container port, handling over 47 million TEUs in recent years. This prominence is attributed to the region's robust manufacturing sector and export-oriented economies.

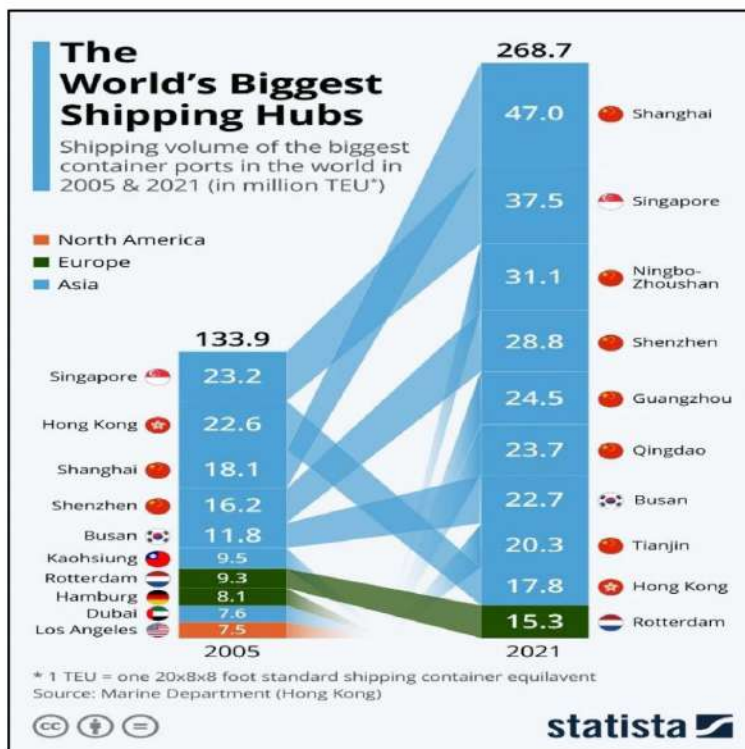
Europe

Europe maintains a significant presence in global container shipping, with ports like Rotterdam, Antwerp, and Hamburg serving as key gateways. The Port of Rotterdam, Europe's largest, handled approximately 14.8 million TEUs in 2021. European ports benefit from advanced infrastructure and serve as critical hubs connecting trade routes between Asia, the Americas, and Africa.

North America

In North America, ports on both the East and West Coasts are integral to international trade. The ports of Los Angeles and Long Beach collectively manage a substantial portion of the United States' containerized imports, particularly from Asia. In 2021, the Port of Los Angeles alone processed over 10.7 million TEUs, setting a new record. These ports are vital for the distribution of goods across the continent, supported by extensive rail and road networks.

Figure 2 Growth of World's Largest Container Ports by Volume



Source: *Statista*

Emerging Markets

Emerging economies, notably in Africa and South America, are experiencing growth in container shipping activities. Investments in port infrastructure and regional trade agreements have bolstered container traffic in these regions. For example, the Port of Santos in Brazil is the busiest in South America, handling over 4 million TEUs annually.

Similarly, ports in Africa, such as the Port of Durban in South Africa, are expanding to accommodate increasing trade volumes.²

Figure 3 Container Shipping Growth by Region



Source: Primary Research, CMI Data repository

Market Dynamics and Future Outlook

The container shipping industry is subject to dynamic market forces, including fluctuations in global trade, economic cycles, and geopolitical events. Recent years have witnessed unprecedented challenges, such as the COVID-19 pandemic, which disrupted supply chains and led to container shortages. Despite these hurdles, the industry has demonstrated resilience.

Projections indicate a positive trajectory for the container shipping market. The market size was valued at approximately USD 120.69 billion in 2023 and is projected to reach USD 146.79 billion by 2031, growing at a Compound Annual Growth Rate (CAGR) of 4.99% during the forecast period. This growth is driven by factors such as the expansion of e-commerce.

² <https://www.statista.com/statistics/1234875/leading-container-ports-worldwide-teu/>

1.2 GLOBAL CONTEXT OF CONTAINER SHORTAGE AND SUPPLY CHAIN DISRUPTIONS

The container shortage is not an isolated issue confined to India; it is a global phenomenon influenced by a series of interconnected events and crises. Understanding these global events provides a comprehensive backdrop to the challenges faced by India's supply chain.

1.2.1 COVID-19 Pandemic

The onset of the COVID-19 pandemic in early 2020 led to unprecedented disruptions in global supply chains. Lockdowns and restrictions imposed worldwide resulted in the temporary closure of manufacturing units, causing a significant drop in production. As economies began to recover, there was a surge in demand for goods, leading to an imbalance between supply and demand. This sudden spike in demand strained the availability of shipping containers, as many were stranded in ports due to earlier disruptions.

1.2.2 Suez Canal Blockage

In March 2021, the Ever Given, one of the world's largest container ships, became lodged in the Suez Canal, blocking this critical maritime route for six days. The Suez Canal is a vital artery for global trade, and its blockage had a cascading effect on supply chains worldwide. The incident delayed goods, impacted industries with existing shortages, and highlighted the vulnerabilities in global trade routes.³

1.2.3 Red Sea Crisis

The Red Sea crisis refers to a series of maritime security incidents that began in late 2023, significantly impacting global shipping routes and supply chains. The crisis was primarily driven by attacks from Yemen's Iran-backed Houthi rebels targeting commercial vessels in the Red Sea, a critical maritime corridor for international trade.

³ <https://www.cognitivemarketresearch.com>

1.3 STATEMENT OF THE PROBLEM

Container shortages have emerged as a critical challenge in global trade, disrupting supply chains and increasing logistics costs. In India, this issue has been exacerbated by evolving global trade patterns, shifts in demand and supply dynamics, and policy interventions. Factors such as trade imbalances, port congestion, changing international shipping routes, and geopolitical tensions have contributed to container shortages, affecting exporters and importers alike. Additionally, government policies, including restrictions on empty container repositioning, port regulations, and tariff structures, have further influenced container availability and supply chain efficiency.

The impact of these disruptions is far-reaching, leading to shipment delays, increased freight rates, reduced trade competitiveness, and financial strain on businesses. Sectors such as manufacturing, agriculture, and retail, which rely heavily on containerized trade, face significant challenges in maintaining smooth operations. Furthermore, the lack of a resilient logistics framework and digital integration has amplified the crisis, making it difficult for stakeholders to predict and manage supply chain disruptions effectively.

This study aims to examine the interplay between global trade patterns, government policies, and container shortages in India's supply chain. It will identify key bottlenecks, analyze their impact on trade flows, and explore mitigation strategies such as policy reforms, infrastructure improvements, and digital solutions to enhance supply chain resilience. By addressing these critical issues, the research seeks to contribute to the development of a more stable and efficient containerized trade system in India.

1.4 OBJECTIVES

The primary objectives of this study are:

- To analyze the causes of container shortages in the global market.
- To explore mitigation strategies to overcome container shortages.

1.5 RESEARCH METHODOLOGY

This study adopts a mixed-method approach, integrating both qualitative and quantitative research methods to provide a comprehensive understanding of container shortages and their impact on supply chain disruptions. Conducting Focus group interviews and surveys with industry stakeholders, including exporters, importers, freight forwarders, and port authorities. Secondary data will be gathered from industry reports, academic journals, and official statistics to support the analysis. The data will be analyzed using statistical tools to identify patterns and correlations, while qualitative data will be interpreted through theoretical analysis. This approach enables a holistic examination of the issue by combining empirical evidence with stakeholders' insights. A descriptive research design will be employed to provide an in-depth overview of the current situation and explore the causal relationships between container shortages and supply chain disruptions.

1.6 SCOPE OF THE STUDY

This research focuses on analyzing container shortages and supply chain disruptions within the global context, considering both domestic and international trade dynamics. It examines the impact on various stakeholders, including exporters, importers, freight forwarders, and shipping lines. Additionally, the study explores mitigation strategies at different levels, ranging from operational adjustments to policy interventions, to enhance supply chain resilience.

1.7 LIMITATIONS

This study is subject to certain limitations, including:

- Potential biases in primary data collection due to the subjective perspectives of stakeholders.
- Generalizability of findings may be restricted to the Indian context and may not be applicable to other regions.
- It reflects a specific period and may not represent future disruptions or developments.

CHAPTER 2
REVIEW OF LITERATURE

The global supply chain ecosystem has experienced unprecedented disruptions in recent years, with container shortages emerging as one of the most pressing challenges affecting international trade. This complex issue stems from a confluence of factors including global crises, structural inefficiencies in logistics networks, economic imbalances, and systemic vulnerabilities within supply chain systems. The COVID-19 pandemic served as a major catalyst for these disruptions, exposing the fragility of just-in-time supply chains and highlighting the interconnected nature of global trade. As noted by Kuźmierz (2022), the pandemic triggered a cascade of logistical challenges including port congestion, blank sailings, and dramatic increases in freight rates, which were further exacerbated by labor shortages and changing consumption patterns. These disruptions were compounded by subsequent geopolitical events such as the Suez Canal blockage in 2021 and the ongoing conflict in Ukraine, which introduced additional volatility into an already strained system (Bø, 2022; Logvinov, 2024). The cumulative impact of these events has been profound, with ripple effects felt across multiple industries and regions, underscoring the need for a comprehensive understanding of both the causes and potential solutions to container shortages and supply chain disruptions.

Beyond these acute crises, deeper structural issues within global logistics networks have contributed significantly to container shortages. Aguilar-Mäkelä (2022) identifies several key factors including chronic port congestion, manufacturing slowdowns in key exporting nations, and fundamental imbalances between supply and demand for shipping containers. Virtala (2024) further elaborates on these logistical inefficiencies, noting how poor intermodal connectivity and suboptimal container repositioning strategies have created persistent bottlenecks in the system. The problem is particularly acute in the realm of international trade, where Edirisinghe et al. (2016) demonstrate how trade imbalances lead to the uneven distribution of containers, with surplus regions accumulating empty containers while deficit regions face chronic shortages. This imbalance is further complicated by the just-in-time nature of modern supply chains, which leaves little room for error when disruptions occur (D'Amico, 2023). Ivanov and Dolgui (2022) introduce the broader concept of the "shortage economy," arguing that contemporary supply chains are particularly vulnerable to disruptions due to their lean configurations, globalization, and dependence on complex networks of suppliers. These systemic vulnerabilities are particularly evident in specialized supply chains such as

those for perishable goods, where Ali et al. (2017) identify additional challenges including temperature variability, cold chain interruptions, and infrastructure limitations that compound the basic issues of container availability.

In response to these multifaceted challenges, researchers have proposed a variety of mitigation strategies aimed at enhancing supply chain resilience and addressing container shortages. At the strategic level, Kamalahmadia and Parast (2016) demonstrate the effectiveness of redundancy-based approaches including pre-positioned inventory, backup suppliers, and protected supply lines. These findings are supported by Tang (2007), who advocates for robust supply chain designs incorporating multiple sourcing options, flexible transportation networks, and strategic safety stocks. The digital transformation of supply chains has emerged as another critical avenue for improvement, with Toygar et al. (2023) highlighting how technologies such as blockchain, IoT sensors, and predictive analytics can significantly enhance supply chain visibility and responsiveness. Edirisinghe's (2016) concept of Virtual Container Pools (VCPs) represents a particularly innovative application of digital solutions, proposing a shared container resource system enabled by real-time tracking and blockchain technology to optimize container utilization across multiple shipping lines. Infrastructure improvements constitute another essential component of mitigation strategies, with Huang et al. (2022) emphasizing the importance of optimized hub-and-spoke port networks incorporating backup hubs to enhance system resilience. Similarly, Aziz et al. (2024) stress the need for expanded transport routes and upgraded cold chain infrastructure to support specialized supply chains. Collaborative approaches have also gained prominence in the literature, with Yi (2022) and El Din et al. (2021) both underscoring the value of strategic alliances among supply chain stakeholders to improve coordination and resource sharing.

The role of transshipment ports in mitigating supply chain disruptions deserves particular attention, as these facilities serve as critical nodes in global trade networks. Huang et al. (2022) provide compelling evidence that well-designed hub-and-spoke systems with strategically located transshipment hubs can significantly reduce congestion and improve system resilience. These ports not only facilitate the efficient redistribution of containers but also provide crucial flexibility when primary routes are disrupted. The development of efficient transshipment hubs has been shown to have broader economic benefits as well, reducing shipping costs and supporting regional

industrial development. However, the effectiveness of these ports depends on careful planning and investment in both physical infrastructure and digital systems to ensure smooth operations and coordination with other elements of the supply chain.

Despite these advances in understanding and addressing supply chain disruptions, significant gaps remain in the research literature. Sudan et al. (2023) identify several promising directions for future research, including the development of more comprehensive risk management frameworks that integrate organizational resilience with operational strategies. Yi (2022) calls for additional investigation into the sustainability of logistics alliances, particularly in the context of evolving environmental regulations and sustainability goals. Emerging technologies such as artificial intelligence and autonomous shipping systems present additional opportunities for research and innovation in supply chain management. There is also a need for more interdisciplinary research that bridges the gap between technical logistics solutions and broader economic and policy considerations. As global trade continues to evolve in response to geopolitical shifts, environmental challenges, and technological advancements, ongoing research will be essential to developing supply chains that are not only resilient to disruptions but also sustainable and equitable.

In conclusion, the issue of container shortages and supply chain disruptions represents a complex challenge with far-reaching implications for global trade and economic stability. The literature reveals that these problems stem from both immediate crises and deeper structural issues within global logistics systems. While significant progress has been made in developing mitigation strategies ranging from technological solutions to collaborative approaches, the dynamic nature of global trade ensures that this will remain an area requiring ongoing research and innovation. The lessons learned from recent disruptions provide valuable insights for building more resilient supply chains, but they also highlight the need for continuous adaptation to new challenges and opportunities. As the global economy becomes increasingly interconnected yet vulnerable to shocks, the development of robust, flexible, and sustainable supply chain systems will remain a critical priority for researchers, practitioners, and policymakers alike. Future efforts must balance immediate operational improvements with longer-term strategic planning to create supply chains that can withstand future disruptions while supporting sustainable economic growth.

CHAPTER 3

ANALYZE THE CAUSES OF CONTAINER SHORTAGES IN THE GLOBAL MARKET

3.1 INTRODUCTION

The global shipping industry, an essential backbone of international trade, has faced unprecedented challenges in recent years. One of the most critical issues that emerged, particularly since the onset of the COVID-19 pandemic, is the acute shortage of shipping containers. This shortage has disrupted global supply chains, inflated freight rates, delayed cargo movement, and exposed vulnerabilities in logistics infrastructure. Understanding the underlying causes of container shortages is therefore a fundamental step in formulating resilient strategies for future supply chain management.

This chapter aims to analyze the primary causes of container shortages by drawing on insights collected through primary data from experienced stakeholders in the shipping and logistics industry. The respondents — representing a diverse mix of operations, freight forwarding, and planning roles — provided valuable perspectives based on their direct experiences in regions such as Asia-Middle East, Asia-Europe, and Transpacific trade lanes.

Container shortages are not attributable to a single cause; instead, they result from a complex interplay of factors such as port congestion, blank sailings, labor shortages, trade imbalances, inefficient repositioning practices, and policy-related barriers. The objective of this chapter is to dissect these contributing elements using the survey responses and identify which of these were perceived as the most disruptive by industry practitioners.⁴

3.2 RESEARCH DESIGN AND METHODOLOGY

Understanding the underlying causes of container shortages requires an investigative approach grounded in the practical realities faced by industry professionals. Given the complexity and multidimensional nature of the problem, this study adopts a qualitative and descriptive research design to collect and interpret expert opinions.

The methodology followed in this chapter ensures that insights from key stakeholders across the shipping and logistics industry are captured, classified, and analyzed in a structured and meaningful way.

⁴ <https://www.worldbank.org/en/news/press-release/2022/05/26/container-port-performance-index-2021>

3.2.1 Research Design

This study uses an exploratory and descriptive research design. The exploratory aspect helps uncover new insights into the evolving causes of container shortages, while the descriptive element categorizes and interprets the experiences and opinions of selected stakeholders.

The research design is rooted in primary qualitative data, with some quantitative indicators (such as frequency and Likert-scale ratings) incorporated to enhance clarity and support comparative interpretation.

3.2.2 Data Collection Method

Primary data was collected through a structured Google Form survey, designed with both close-ended and open-ended questions. The questionnaire included rating scales (e.g., impact levels), multiple-choice options, and text-based input areas to encourage elaboration on observed issues.

Key focus areas of the form:

- Perceived major causes of container shortages.
- Specific container types affected.
- Trade routes impacted.
- Operational inefficiencies and policy barriers.
- Suggestions for resolving shortages.

3.2.3 Sampling Method

A purposive sampling technique was adopted to identify and approach professionals with direct experience in container operations, shipping logistics, and international trade. This method ensures the inclusion of stakeholders who possess first-hand, relevant insights into the current disruptions.

3.2.4 Respondent Profile

A total of five industry stakeholders were surveyed. They hold various roles such as logistics coordinators, freight forwarders, container operations managers, and planners. Their cumulative experience spans over 40+ years and includes working across trade routes like Asia–Middle East, Asia–Europe, and Trans-Pacific corridors.

Table 1 Stakeholder Profile Overview

Respondent ID	Role / Designation	Years of Experience	Key Trade Lanes	Organization Type
R1	Founder and Director	12	All sector	Freight Forwarder
R2	Shipping Executive	20	Asia – Middle east	Liner agency
R3	Operations Executive	8	Asia – Middle east, Europe	Shipping Company
R4	Pricing	2	India – Gulf	Freight Forwarder
R5	Planning and Strategy	9	Intra-Asia, Asia - Europe	Shipping Line

Source: Primary data

3.2.5 Data Analysis Method

The analysis of stakeholder responses followed a mixed-method approach:

a) Thematic Content Analysis

Used to interpret qualitative feedback from open-ended responses. Themes such as “Port Congestion,” “Policy Delays,” “Blank Sailings,” etc., were identified based on keyword frequency and contextual emphasis.

b) Descriptive Analysis

Used for quantitative inputs (e.g., Likert-scale responses rating the severity of each cause). Results were visualized using bar charts and frequency tables.

3.2.6 Validity and Limitations

While the responses reflect genuine industry insights, the sample size (five respondents) limits generalizability. However, the depth and diversity of roles and routes enhance the validity and contextual richness of the findings. Future studies may expand sample size or triangulate findings with secondary data.

3.3 ANALYSIS OF CAUSES OF CONTAINER SHORTAGES

This section examines the underlying causes of container shortages in the global market by analyzing primary data collected from five experienced stakeholders across different sectors of the shipping and logistics industry. The analysis identifies recurring themes, prioritizes them by frequency, and evaluates their systemic impact on the global supply chain.

3.3.1 Frequency and Classification of Identified Causes

The stakeholders were asked to identify the primary causes of the ongoing container shortage. Their responses were classified into eight recurring themes. The frequency of each cause was tallied to assess its prevalence among the respondents.

Table 2 Reported Causes of Container Shortages (Frequency-Based)

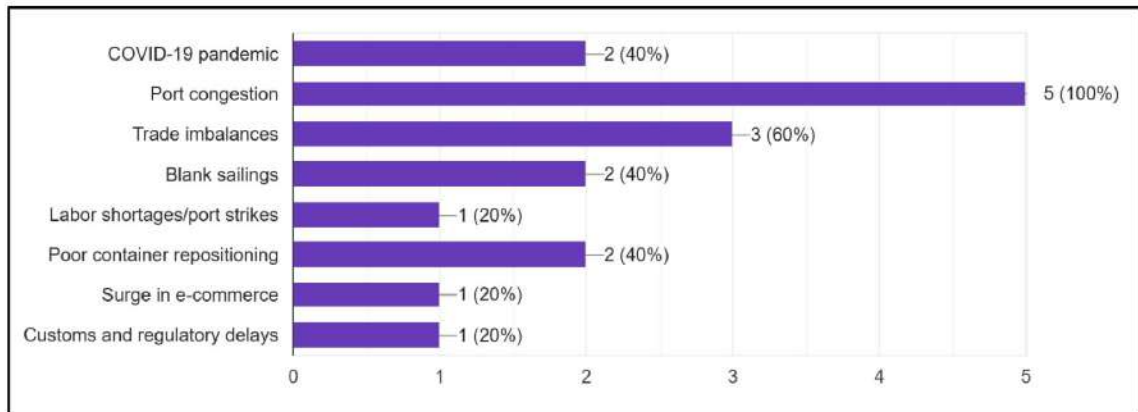
Cause	Frequency (n = 5)	Percentage (%)
Port Congestion	5	100%
Trade Imbalances	3	60%
Poor Container Repositioning	2	40%
COVID-19 Related Disruptions	2	40%
Blank Sailings and Schedule Cancellation	2	40%
Customs and Regulatory Delays	1	20%
Labor Shortages / Port Strikes	1	20%
Surge in E-Commerce Demand	1	20%

Source: Primary data

3.3.2 Visualization of Findings

To further illustrate the distribution of perceived causes, a bar chart is used below.

Figure 4 Frequency Distribution of Container Shortage Causes by the respondents



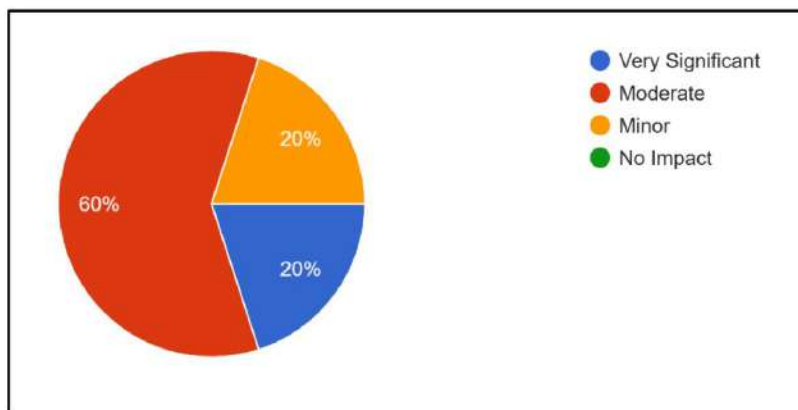
Source: Primary data

3.3.3 Thematic Analysis of Identified Causes

A. Port Congestion

All respondents recognized port congestion as a constraint contributing to container shortages. High vessel waiting times, terminal yard overflow, and inefficient berthing procedures were the common operational bottlenecks. Congested ports not only delayed container offloading but also led to reduced container availability for the next shipment cycles, especially in transshipment hubs.

Figure 5 Significance of Port congestion mentioned by the stakeholders

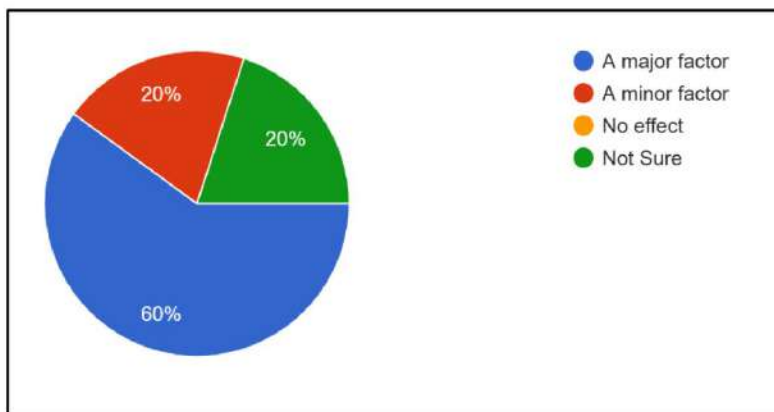


Source: Primary data

B. Trade Imbalances

Trade imbalances, particularly between import-heavy and export-heavy regions, were cited by 80% of the respondents. These imbalances led to uneven container flow, where certain regions experienced container surpluses while others suffered acute shortages. This problem was magnified by the absence of synchronized repositioning efforts by carriers.

Figure 6 : Contribution of Trade imbalance between exporting and importing country to the issue

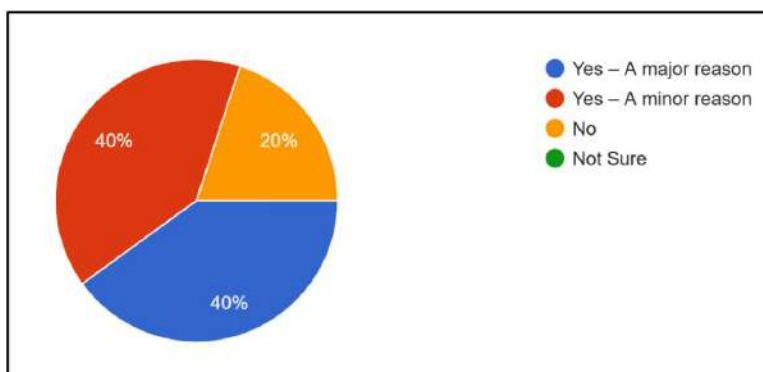


Source: Primary data

C. Ineffective Repositioning of Empty Containers

Two out of five stakeholders identified inefficient repositioning as a direct cause of container shortage. The cost and time associated with moving empty containers back to demand centers discouraged timely returns, further worsening availability at key export ports.

Figure 7 Contribution of Poor container tracking and repositioning strategies

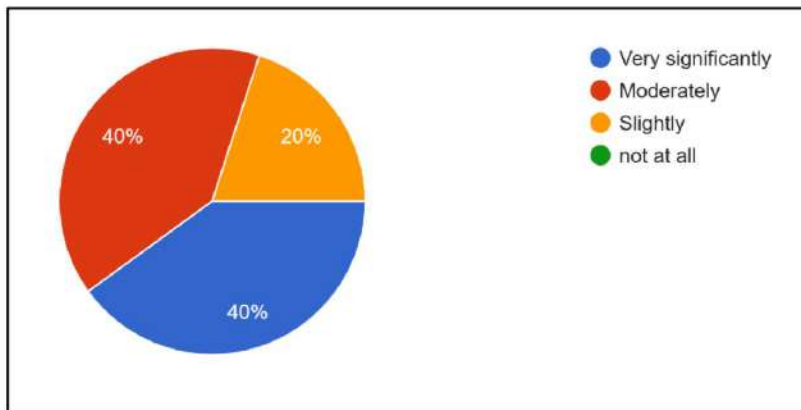


Source: Primary data

D. COVID-19 Disruptions

The COVID-19 pandemic was identified by 40% of stakeholders as a significant factor. Its impact included reduced port workforce, delays due to quarantine protocols, disruption of intermodal logistics, and uneven recovery rates across global trade routes, which cumulatively created bottlenecks in container circulation.

Figure 8 : COVID-19 pandemic contribution to the container imbalance

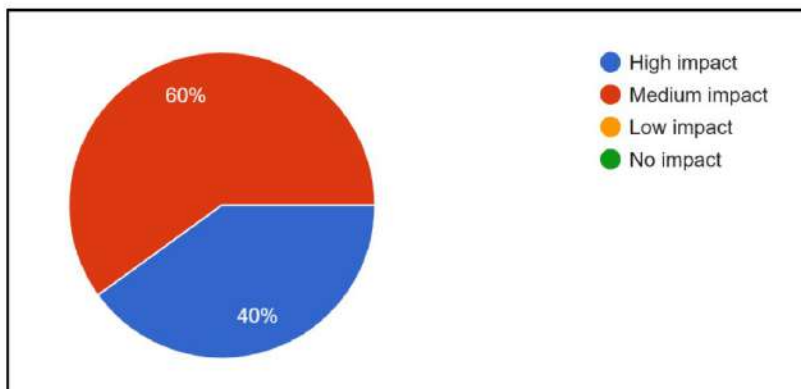


Source: Primary data

E. Blank Sailings and Cancellations

Blank sailings were another reported cause. Shipping lines canceled scheduled voyages to manage capacity and cost, which led to fewer containers being repositioned and resulted in longer waiting periods for container availability at origin ports.

Figure 9 : Impact of Blank sailings and Supply-demand mismatch have on container availability



Source: Primary data

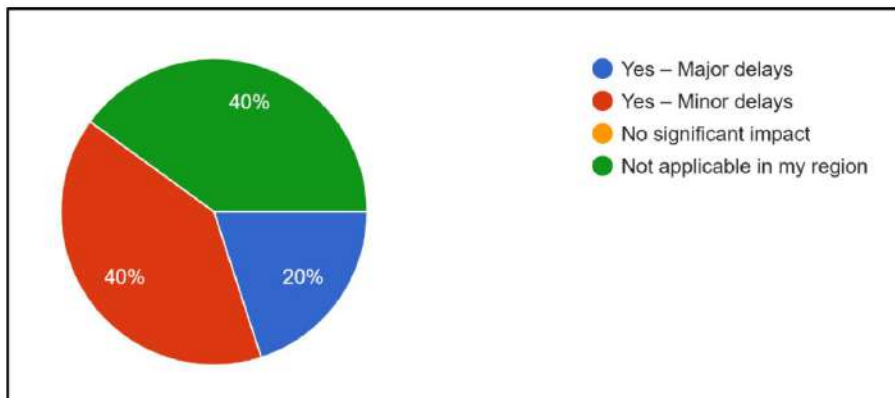
F. Customs and Regulatory Delays

Two respondents pointed out bureaucratic and procedural delays in customs clearance as contributing to stagnant container flows. Regulatory discrepancies between ports led to delays in container movement, particularly affecting turnaround times.

G. Labor Shortages and Strikes

Labor issues, including strikes and staffing shortages at port terminals, though mentioned less frequently, still played a role in restricting terminal efficiency and container handling capacity, further affecting supply chain fluidity.

Figure 10: Impact of Labor shortages or port strikes affected container flow



Source: Primary data

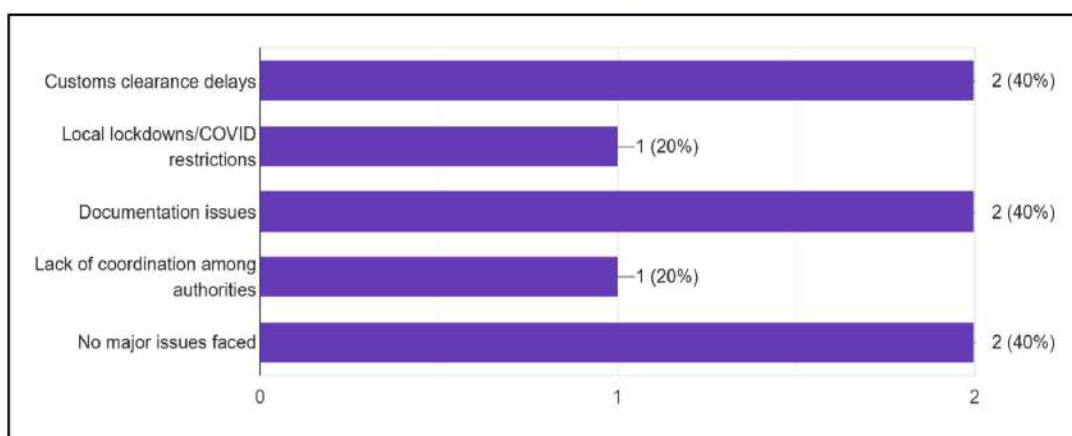
H. E-Commerce Demand Surge

One stakeholder noted the explosive growth of e-commerce post-pandemic, which spiked short-term demand for containerized cargo and stressed container availability further due to unanticipated order volumes.

3.3.4 Policy-related or regulatory challenges affecting container movement

To synthesize the systemic dynamics of the Policy-related or regulatory challenges affecting container movement, a diagram is provided.

Figure 11: Policy-related or regulatory challenges affecting container movement



Source: Primary data

3.3.5 Key Causes and Impacts

Table 3: Summary of Thematic Causes and Their Systemic Impacts

Cause	Systemic Impact
Port Congestion	Delay in container turnaround; reduced equipment circulation
Trade Imbalances	Excess containers in import zones; scarcity in export zones
Poor Repositioning Strategy	Imbalance persists; higher leasing costs
COVID-19 Disruptions	Slowed port and customs operations; disrupted global schedules
Blank Sailings	Reduced container flow; increased dwell time
Regulatory/Customs Delays	Clearance issues; reduced operational efficiency
Labor Shortages/Strikes	Slower loading/unloading; longer vessel turnaround
E-Commerce Demand Surge	Sudden spike in short-term demand; mismatch in planning

Source: Review of Maritime Transport 2022

3.4 SUMMARY

This chapter focused on analyzing the root causes behind the global container shortage by integrating insights from both secondary literature and primary data collected from industry stakeholders. The findings reveal that the container shortage is a multifaceted issue driven by a combination of operational inefficiencies, market dynamics, and external shocks. The key findings from the analysis are summarized as follows:

3.4.1 Port Congestion Emerged as the Most Critical Cause

All stakeholder responses consistently identified port congestion as a primary bottleneck in the global container supply chain. Factors contributing to this congestion included limited berth availability, terminal yard overflows, delays in vessel handling, and truck turnaround inefficiencies. These operational constraints severely delayed container circulation and turnaround times.

3.4.2 Trade Imbalances Create Uneven Container Distribution

The uneven flow of trade—especially the dominance of imports in Western economies compared to export-heavy Asian countries—has led to a significant misallocation of containers globally. Export ports frequently face shortages, while import-dominated ports experience container pile-ups, highlighting the need for better repositioning strategies.

3.4.3 Inefficiencies in Empty Container Repositioning

One of the recurring concerns across the responses was the lack of a coordinated global approach to reposition empty containers efficiently. The financial burden and logistical complexity associated with moving empties have discouraged carriers and forwarders, causing prolonged equipment unavailability at key shipping origins.

3.4.4 Pandemic-Induced Disruptions Had Lingering Effects

Although the COVID-19 crisis has abated, its aftershocks continue to impact the supply chain. Labor shortages, quarantines, and lockdown-induced slowdowns during the pandemic disrupted the regular flow of containers, resulting in a backlog that has yet to fully recover.

3.4.5 Carrier-Led Blank Sailings and Capacity Adjustments

Strategic decisions by carriers to cancel sailings and consolidate capacity during low-demand periods have inadvertently worsened the container availability problem. These blank sailings reduced container flow back to ports of origin, disrupting the balance between supply and demand.

3.4.6 Regulatory and Customs Delays Impact Equipment Turnaround

Regulatory inefficiencies, especially in terms of customs clearance and port documentation, emerged as another factor impeding smooth container movement. These procedural delays contributed to increased dwell times and operational inefficiencies.

3.4.7 Sudden Surge in Demand, Especially from E-Commerce, Stressed the System

The explosive growth in e-commerce during the pandemic led to unpredictable and concentrated demand surges for containerized cargo. This mismatch between planning capacity and actual demand placed further strain on the already limited supply of containers.

3.4.8 Complex Interdependencies Aggravate the Problem

The findings indicate that no single factor can be isolated as the sole reason for container shortages. Instead, a combination of interconnected variables—operational, economic, and policy-related—have compounded to create a structural imbalance in global container availability.

3.5 CONCLUSION

The purpose of this chapter was to fulfill the first objective of the study: to analyze the causes of container shortages in the global market. Through a detailed examination of both primary data from industry stakeholders and secondary research, it is evident that the container shortage crisis is the result of a convergence of structural, operational, and external factors.

Key among these causes is port congestion, trade imbalances, inefficient repositioning of empty containers, and the lingering effects of the COVID-19 pandemic. The compounded impact of blank sailings, regulatory delays, and unpredictable spikes in demand, particularly from the e-commerce sector has exacerbated the situation. These

factors not only disrupted the smooth flow of containerized cargo but also challenged the resilience and responsiveness of global supply chains.

The analysis reveals that container shortages are not simply the outcome of temporary logistical constraints but a symptom of deeper systemic inefficiencies within the maritime and logistics sectors. The findings underscore the urgent need for improved planning, digitized coordination, better forecasting, and collaborative global strategies to avoid similar disruptions in the future.

Having identified the key causes, the next chapter will shift focus toward exploring and evaluating the mitigation strategies currently being employed or proposed by industry stakeholders, international organizations, and governments to address this persistent challenge.

CHAPTER 4

**MITIGATION STRATEGIES TO OVERCOME
CONTAINER SHORTAGES**

4.1 INTRODUCTION

This chapter focuses on the second objective of the study: to explore mitigation strategies to overcome container shortages. The global container shortage crisis, which came into sharp focus during the COVID-19 pandemic, has revealed significant vulnerabilities in the international logistics and maritime transport systems. It disrupted global trade flows, escalated freight costs, and exposed the lack of resilience in container availability and repositioning mechanisms. As the industry transitions from crisis response to long-term strategic planning, the identification and evaluation of effective mitigation strategies have become crucial for ensuring future supply chain stability.

In contrast to Chapter 3, which relied on primary qualitative data from industry stakeholders to analyze the causes of container shortages, this chapter adopts a secondary data-based approach to examine mitigation measures that have been proposed or implemented globally. This includes strategies undertaken by shipping lines, port authorities, logistics service providers, and governmental bodies in response to supply chain disruptions and container imbalances.

The use of secondary data—drawn from peer-reviewed journals, industry reports, policy documents, and trade publications—enables a comprehensive understanding of the diverse responses to container shortages across different regions and organizational levels. Through qualitative content analysis, the chapter categorizes mitigation strategies into thematic groups such as operational, technological, policy-driven, and financial interventions. These themes are critically analyzed to assess their effectiveness, adaptability, and long-term sustainability.

By examining a range of documented strategies, this chapter aims to provide a consolidated view of best practices and emerging solutions that can strengthen the resilience of container logistics systems. The insights gained will not only contribute to academic understanding but also serve as a reference for industry practitioners and policymakers engaged in crisis management and supply chain optimization.

Container shortages have posed critical challenges for global and Indian trade, prompting a variety of responses. This chapter addresses the second objective of the study by examining mitigation strategies – both operational measures and longer-term

solutions – that governments, ports, and companies have adopted domestically and internationally to ease container scarcity. We organize the discussion thematically into operational, infrastructural, digital, and policy-level strategies, illustrating each with data, examples, and case studies from India and elsewhere. Where available, we use secondary sources and official reports to highlight how targeted actions (e.g. extended port hours, domestic manufacturing, digital tracking) can improve container availability and supply-chain resilience.

4.2 OPERATIONAL STRATEGIES

Operational strategies focus on immediate actions by ports, carriers, and shippers to optimize container use and flow. Key measures include improving port turnaround, strategic booking and scheduling by shippers, and rerouting or pooling containers. For example, regulators in major ports extended terminal hours and shifts (often to 24×7 operations) to clear backlogs. In California, the Ports of Los Angeles and Long Beach agreed to double their hours, opening gates on nights and weekends to move containers faster. Similarly, Indian ports like Jawaharlal Nehru Port (JNPT) introduced simultaneous scanning and digital gates to expedite customs clearance and export processing. Incentives to speed up movements have included waiving storage fees for empties at ports – for instance, the Container Corporation of India (CONCOR) allowed up to 90 days free storage of empty containers at JNPT to unclog yards. Railways also slashed long-term detention charges for empties, cutting late-storage fees by half. These steps encourage rapid turnaround of containers so that more boxes return to service for new exports.

Shippers and carriers can likewise adjust operations. Freight forwarders are advised to plan shipments further in advance, secure flexible contracts, and make use of premium cargo products. Industry sources recommend booking ocean freight at least 3–4 weeks ahead and minimizing booking cancellations. Some carriers offer *premium* services (at higher cost) that guarantee priority access to scarce containers or vessel space. Shippers of high-value goods have increasingly paid extra for assured equipment, while accepting that this raises costs. Maintaining flexibility in shipment size and packaging (e.g. using larger or non-standard containers, when possible) can also help expand capacity. In practice, firms have begun shifting to alternative transport routes or modes; for example, some Indian exporters have looked at rail or road routes and feeder ports to avoid congested hubs. Globally, shippers have even redirected cargo: during the US-

West Coast crisis, some moved goods via Canadian ports (Prince Rupert) or all-water services to East Coast ports where congestion was lower. Others in India could similarly consider using smaller or less-congested ports (e.g. Kakinada, Colombo, or Mundra) or multi-modal connections to reduce delays.

- **Key operational tactics include:** extended port terminal hours (night/weekend shifts), expedited customs and scanning (e.g. simultaneous scanning at JNPT), fast-tracking empty containers out of yards (incentives for quick removal), and encouraging rail/road carriers to improve terminal dwell times (weekend gates).
- **Strategic booking and routing:** shippers are advised to secure space early and consider alternative ports/routes. For instance, planners have shifted some Asian cargo from US West Coast to East Coast or even chartered general-cargo vessels to bypass the container backlog. Container chartering remains a niche (no spare cellular vessels are available), but it has been used as an emergency measure.⁵

4.2 INFRASTRUCTURAL STRATEGIES

Infrastructural strategies address the physical supply of containers and related capacity. This includes expanding fleets of ships and containers, building or upgrading ports and inland hubs, and developing domestic production of containers. India's government and private sector have launched several such initiatives.

- ❖ **Expanding the container fleet:** The Shipping Corporation of India (SCI) and other operators have chartered and acquired new vessels. In late 2024, SCI announced immediate chartering of additional container ships to add roughly 9,000 TEU of capacity, and plans to purchase five more new container vessels. These moves directly increase India's container lift capacity and reduce dependence on foreign-flagged lines. Internationally, major carriers are also ordering new ships to boost supply: McKinsey reports that ocean carriers projected 5.5 million TEU of new vessel capacity by end of 2024.
- ❖ **Domestic container manufacturing:** Historically almost all containers used by India were imported (mostly from China). To gain control of supply, India has sought to build local container-making capacity. In 2021 the Ministry of Ports, Shipping and Waterways set up a committee to explore manufacturing

⁵ <https://www.commerce.gov.in/>

containers at hubs like Bhavnagar, Gujarat. The Atmanirbhar Bharat ('self-reliant') initiative explicitly lists container production as a target – domestic manufacturing of standard ISO boxes is expected to be “a big part” of the government’s export-promotion drive. Industry experts note that India currently has *no* container factories, leaving it vulnerable; they suggest technical collaboration with global leaders (e.g. China’s CIMC) to fast-track expertise. Incentives such as subsidies or Production-Linked Incentive (PLI) schemes for container makers have been proposed, aiming to lower costs and make Indian-made containers competitive. If successful, local production could vastly increase box availability and buffer against global spikes in demand.

- ❖ **Port and rail capacity:** Major Indian ports have rapidly expanded container handling capacity over the last decade. For example, JNPT (Nhava Sheva) increased its capacity by 87% from 2014–15 to 2023–24. Other major ports reported expansions of 30–150% (see Chapter 3). Government programs like *Sagarmala* and the development of the Dedicated Freight Corridor aim to boost container throughput by improving ports, hinterland rail connectivity, and inland container depots (ICDs). The Government’s July 2024 report lists multi-fold capacity growth at Paradip, Kamarajar, Chennai, Cochin, and other ports. Inland logistics have been targeted too; for instance, CONCOR is rolling out many new terminals and plans to have 100 container terminals by 2028 (aiming for nationwide coverage). Such expansions increase the number of containers that can be handled and repositioned internally, mitigating shortages caused by bottlenecks.
- ❖ **New ports and terminals:** India is also adding greenfield ports and private terminals to capture growing trade. A key example is the upcoming Vadhavan port on the west coast, a joint India–Korea project. South Korean carrier HMM plans to develop Vadhavan into a mega-container port (23 million TEU capacity) capable of serving 24,000-TEU ships. When completed by 2040, Vadhavan would greatly add to national container throughput. Globally, private port operators and international firms are likewise investing in capacity (e.g. Hutchison’s expansion of Indian container berths).

Overall, infrastructural measures increase the total supply of containers and cargo capacity. The combination of new ships (SCI's fleet plus global carrier orders) and eventual domestic box production could add millions of TEUs to supply. Meanwhile, expanded port berths, cranes and rail links allow ports to unload and turn around more boxes quickly. In sum, these strategies attack the shortage by creating more container and port capacity in India.⁶

4.3 DIGITAL AND DATA-DRIVEN STRATEGIES

Information technology and data platforms play an increasingly important role in mitigating shortages by improving visibility, planning, and coordination in container logistics.

- **Unified data platforms:** India has launched the Unified Logistics Interface Platform (ULIP) and the Logistics Data Bank (LDB) to integrate information from across the supply chain. Launched in 2022 under the National Logistics Policy, ULIP aggregates data from 11 Ministries and dozens of systems, processing over 100 crore API transactions as of early 2025. ULIP “bridges critical data gaps,” enabling real-time cargo tracking, automated documentation, and streamlined regulatory compliance. For example, shippers and regulators can now monitor container movements on road, rail, sea or air in one portal, improving predictability of ETAs and avoiding idle time. These capabilities allow stakeholders to spot congestion or equipment shortages early and reroute or reschedule shipments. The platform also powers digital gate processes (e.g. e-Permit and e-Payment) to reduce terminal dwell times.
- **Port community systems:** Many ports worldwide use dedicated IT systems to share schedules, berth slots, and cargo details among carriers, customs, and trucking firms. India's port terminals have adopted interoperable solutions under ULIP and PCS (Port Community System) frameworks. For instance, simultaneous scanning of export containers at JNPT – powered by shared databases – has cut clearance time in half. As another example, container depots are being integrated into LDB so that empty-equipments stats are visible to all users, helping avoid local gluts of empties.

⁶ <https://www.morethanshipping.com/>

- **Container-exchange marketplaces:** Digital marketplaces allow companies to lease or swap containers quickly. Platforms like Container xChange (Germany-origin) and Boxity have become popular. In India, Container xChange’s marketplace connects shippers, carriers, and leasing firms with available containers worldwide. An Indian case study shows its impact: ARCON Containers (Mumbai-based lessor) reported 5× growth in leasing deals after joining xChange, arranging ~9,500 container leases through the platform in months. The platform’s vetting and price-transparency features let ARCON find reliable partners and competitive lease rates instantly. This kind of digital tool effectively pools global container supply – for example, if one region has surplus empties, they can be offered to another user via the platform. By improving match-making and reducing transaction friction, digital marketplaces accelerate the repositioning of boxes to where they are needed.
- **Advanced analytics and AI:** While less reported in current sources, leading carriers and 3PLs are also using data analytics to forecast demand and optimize routing. For instance, AI models can predict port congestion hotspots and suggest rerouting to alleviate stress. Blockchain pilots (like TradeLens) aim to create single ledgers for intermodal tracking, further reducing paperwork. These technologies complement ULIP/LDB: once adoption is widespread, real-time data could feed decision-support tools that, for example, signal when to deploy extra trains or charter flights for critical shipments.

In summary, digital solutions improve efficiency by making container flows transparent and predictable. India’s ULIP/LDB initiative is a noteworthy example of government-led digital infrastructure that “democratizes access to logistics data,” benefiting exporters and small businesses alike. Combined with private platforms (like container marketplaces) and modern port IT systems, these tools help ensure available containers are put to the best use – a crucial complement to the physical measures described above.

4.4 POLICY, REGULATORY AND COLLABORATION STRATEGIES

Beyond market and technical fixes, governments have implemented policy-level measures to directly ease container shortages and costs. These range from regulatory relief to strategic initiatives that change market structure.

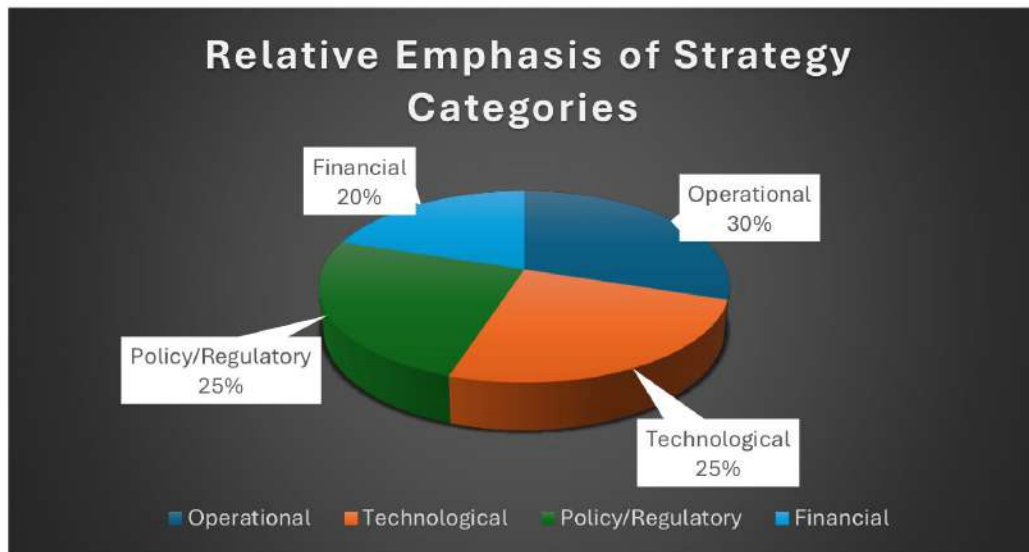
- ✦ **Regulatory relief and incentives:** Faced with urgent exporter woes, Indian authorities have cut or waived many fees. As noted, CONCOR is waiving empty-container storage charges for 90 days at JNPT and Indian Railways halved detention charges beyond 90 days. Customs authorities also extended free storage and demurrage days for exports to allow freight to clear backlogs without penalty. Meanwhile, the Ministry of Ports required private container yards to register with GST and banned cash dealings to curb illegal profiteering. These steps reduce cost inflation: a PSU report estimates that Indian exporters pay substantially more in freight due to container crunch and reliance on foreign carriers, and lowering these surcharges directly protects them.
- ✦ **Whole of Government coordination:** High-level task forces have been formed to address supply-chain disruptions. In September 2024, Commerce Minister Piyush Goyal chaired an inter-ministerial meeting on shipping woes, involving Ports, Shipping, Railways, and Commerce ministries. The resulting action plan combined operational fixes (above) with longer-term strategy. Similarly, India's Service Improvement Group (SIG) mechanism maintains regular dialogue with shipping lines, port authorities and exporters to swiftly identify bottlenecks. This "whole-of-government" approach helps ensure exporters can escalate issues (e.g. delayed containers) and get rapid coordinated responses.
- ✦ **Boosting domestic shipping and production:** Recognizing over-dependence on foreign carriers and suppliers, India is pursuing strategic initiatives to build self-reliance. A flagship example is the proposed "Bharat Container Line" (BCL) – a new national shipping company announced in 2025. Funded by a \$3 billion maritime fund, BCL aims to operate ~100 container ships (some charters) on key trade routes. According to industry press, Indian officials believe a 25% market share by BCL could save exporters up to \$50 billion annually by reducing freight rates and ensuring consistent container availability. In parallel, policy makers encourage existing Indian entities to own and operate their own containers and even non-container shipping (e.g. multi-purpose vessels). The underlying goal is to shift market power back to Indian stakeholders.

- ✦ **International collaboration and security:** Some container disruptions have geopolitical causes (e.g. Red Sea piracy, trade restrictions). Governments have responded by coordinating internationally. India, for instance, has advised merchant ship convoys and coordinated with allies to keep Red Sea routes open. Insurance waivers and security patrols have been arranged for vessels on high-risk routes. Trade diplomacy can also open alternate corridors: the revival of the International North–South Transport Corridor (through Iran/Russia) is partly motivated by reducing reliance on Suez transit. Likewise, multilateral forums (APEC, G20) have proposed stockpiling emergency container supplies or reserves to shore up shortages.
- ✦ **Trade policy adjustments:** In some cases, governments have offered direct trade incentives to ease logistics strain. For example, duty draw-back schemes or tax rebates have been extended for export-critical industries to offset their higher freight. Importantly, export-related levies (e.g. cess on fuel or port services) were suspended at times of acute shortages to lower end-to-end costs for exporters. These policy tweaks help mitigate the immediate economic impact of container shortages on trade volumes.⁷

Overall, policy-level strategies in India have focused on removing barriers and providing alternatives for exporters, while building long-term resilience through domestic capacity. Leading analysts agree that expanding local container manufacture and shipping capacity is key: one think-tank report explicitly urges “boosting domestic container production” and using more Indian liners to cut dependency. In combination with the operational and infrastructural measures above, these policies form a multi-pronged national strategy against container shortages.

⁷ <https://www.container-xchange.com/homepage-row/>

Figure 12: Relative Emphasis of Strategy Categories



Source:UNCTAD (2021). Review of Maritime Transport 2021

4.5 DETAILED ANALYSIS OF KEY STRATEGIES

This section provides an in-depth analysis of selected mitigation strategies implemented globally to address the issue of container shortages. The analysis focuses on the rationale, execution, effectiveness, and limitations of each strategy, supported by real-world examples and data drawn from secondary sources.

Table 4: Summary of Mitigation Strategies for Container Shortages

Category	Strategy	Description	Reference
Operational	Repositioning of empty containers	Efficient relocation of empty containers to areas with higher demand	ShipUniverse (2024)
Operational	Adjusting vessel deployment	Deploying smaller vessels to match supply with fluctuating demand	WSJ (2025)
Technological	Digital platforms and blockchain technologies	Real-time tracking and improved transparency in container movements	ScienceDirect (2023)

Technological	AI and machine learning algorithms	Predictive analytics for demand forecasting and container allocation	ScienceDirect (2023)
Policy and Regulatory	Streamlining customs procedures	Simplifying customs processes to expedite container clearance	World Bank (2023)
Policy and Regulatory	International collaborations	Harmonizing regulations and promoting information sharing among countries	World Bank (2023)
Financial and Capacity	Investment in new container production	Increasing container manufacturing to meet demand	ShipUniverse (2024)
Financial and Capacity	Leasing and pooling arrangements	Flexible financing models to enhance container availability	ShipUniverse (2024)

Note: The references correspond to the sources cited in the respective sections above.

4.5.1 Empty Container Repositioning Programs

One of the most immediate responses to container imbalances involved the strategic repositioning of empty containers from low-demand areas to high-export regions. Major shipping lines such as Maersk and Hapag-Lloyd diverted ships solely to retrieve empty containers from congested ports in North America and Europe back to manufacturing hubs in Asia.

While effective in the short term, this strategy increased operational costs and environmental emissions. Moreover, excessive repositioning without corresponding export planning led to equipment pile-ups in some regions. Thus, while necessary, repositioning is not a sustainable long-term solution without improved container utilization practices.

4.5.2 Round-Trip Container Utilization

To reduce the incidence of containers returning empty, stakeholders began promoting round-trip container usage. This model allows importers to retain containers temporarily and use them for subsequent export cargo.

For example, in India, the Container Corporation of India (CONCOR) launched initiatives enabling exporters in the hinterland to reuse containers brought in for imports. This not only reduced empty repositioning but also improved turnaround time. However, coordination between importers and exporters remains a challenge, especially where demand and supply are spatially mismatched.

4.5.3 Investment in New Container Manufacturing

A significant uptick in container manufacturing was observed in 2021, primarily in China, which accounts for over 90% of global container production. Manufacturers like CIMC Group scaled up production to meet the surging demand.

According to Drewry (2022), global production of new containers increased by over 60% in 2021 compared to the previous year. However, rising raw material costs and dependency on Chinese suppliers have raised concerns about long-term supply diversity. Encouraging localized or regional container production could improve resilience but requires policy support and investment.

4.5.4 Smart Port and Digitalization Initiatives

The deployment of digital technologies in ports and supply chains played a crucial role in addressing delays and congestion during the container shortage crisis. Ports such as Rotterdam and Singapore implemented digital twin systems, AI-enabled yard planning, and blockchain-based cargo tracking to enhance visibility and coordination.

Digital platforms like TradeLens and INTTRA allowed multiple stakeholders to share container movement data, which helped in pre-emptive planning and reduced delays. However, the success of such technologies depends on widespread adoption, interoperability, and cybersecurity safeguards.

4.5.5 Governmental and Policy Interventions

Governments also played a pivotal role in alleviating shortages through regulatory flexibility and investment. For instance, the United States Federal Maritime Commission initiated investigations into demurrage and detention practices and

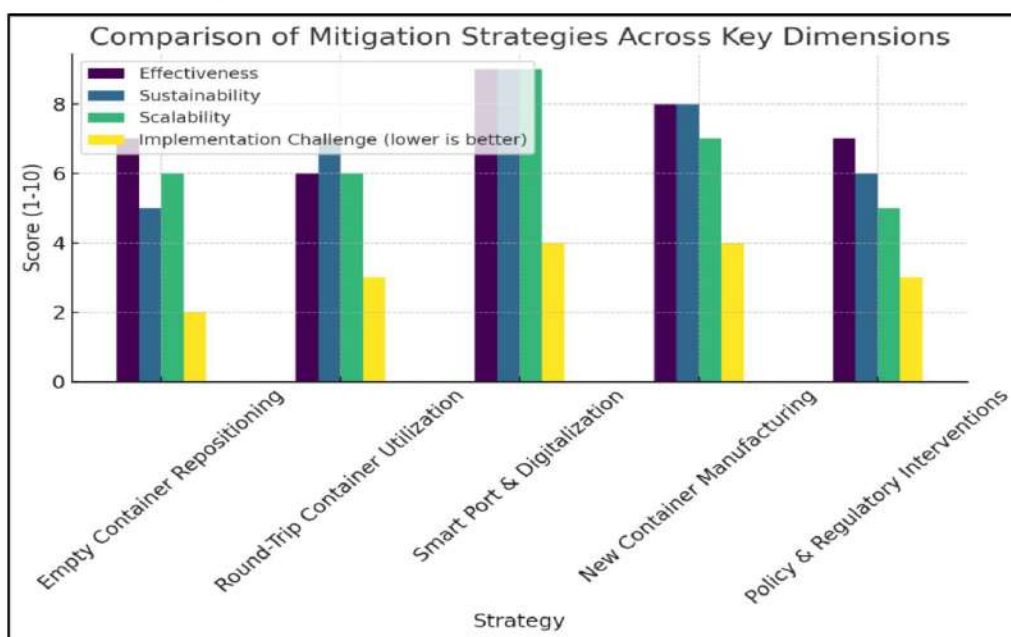
promoted supply chain transparency. India’s Ministry of Ports encouraged the development of inland container depots and multimodal logistics parks to ease port congestion.

While policy responses have helped to some extent, delays in implementation and bureaucratic procedures have often limited their impact. Sustained stakeholder engagement and public-private partnership models are essential for policy-driven strategies to succeed.⁸

4.6 COMPARATIVE ANALYSIS AND DISCUSSION

The previous section outlined a range of mitigation strategies adopted globally to address container shortages. While each intervention has its own merits, their effectiveness varies depending on geographical, economic, and infrastructural contexts. This section presents a comparative analysis of the key strategies by evaluating them based on criteria such as effectiveness, sustainability, scalability, and implementation challenges.

Figure 13: Comparison of Mitigation Strategies Across Key Dimensions



Source: Created by the author.

⁸ <https://www.worldbank.org/en/news/press-release/2024/06/01/regional-disruptions-drive-changes-in-global-container-port-performance-ranking>

4.6.1 Effectiveness of Strategies

From a short-term operational standpoint, empty container repositioning and round-trip container usage were highly effective in restoring container circulation. These strategies provided immediate relief during peak crisis periods, especially in Asia-Pacific export hubs. However, their impact was largely temporary and did not address the structural causes of container imbalances.

In contrast, technological interventions such as real-time tracking and port digitalization showed longer-term potential by increasing supply chain visibility and operational efficiency. Ports that adopted smart logistics platforms experienced quicker turnaround times and better container yard management, illustrating the effectiveness of technology when coupled with data-driven decision-making.

4.6.2 Sustainability and Long-Term Impact

Among all strategies, digitalization and smart port development demonstrate the highest sustainability. These strategies not only improve immediate responsiveness but also future-proof operations against similar disruptions. Furthermore, investments in container manufacturing capacity—while resource-intensive—offer long-term benefits by addressing physical container shortages, particularly if supported by diversification beyond China-centric production.

In contrast, repositioning strategies, though operationally necessary, are less sustainable due to high fuel consumption, increased emissions, and logistical inefficiencies.

4.6.3 Scalability and Replicability

Technological platforms and digital ecosystems are highly scalable and replicable across geographies, provided there is adequate digital infrastructure. Trade facilitation systems, such as blockchain-based platforms, can be adopted by small and large ports alike, given adequate training and stakeholder engagement.

However, financial and policy-based strategies such as government subsidies or stimulus investments are often context-specific. Their replication in other countries depends on political will, regulatory frameworks, and economic conditions.

4.6.4 Implementation Challenges

- ✦ **Infrastructure Gaps:** In developing economies, the lack of modern port infrastructure and hinterland connectivity has limited the success of round-trip usage and smart logistics tools.
- ✦ **Data Sharing Reluctance:** The success of digital platforms depends heavily on trust and willingness among stakeholders to share sensitive logistics data.
- ✦ **Policy Delays:** Regulatory responses are often slow due to administrative inertia and fragmented decision-making across ministries and port authorities.
- ✦ **Dependence on China for Containers:** Even with increased production, over-reliance on Chinese manufacturers presents geopolitical and supply risk concerns.⁹

⁹ <https://www.mckinsey.com/industries/logistics/our-insights/how-container-shipping-could-reinvent-itself-for-the-digital-age>

CHAPTER 5
FINDINGS AND CONCLUSION

After thorough desk research on the issue of container shortages and their impact on global and Indian supply chains, several significant findings have emerged, underscoring the urgent need for efficient and sustainable logistics practices. Through a detailed review of existing literature, multiple contributing factors to container shortages have been identified, including trade imbalances, port congestion, limited container manufacturing capacity, and inefficient container repositioning. These findings highlight the critical importance of understanding and addressing the underlying causes of container unavailability to ensure a resilient and responsive supply chain system.

5.1 FINDINGS

The study of container shortages and related supply chain disruptions has brought to light a series of important findings that reflect both the systemic challenges and the ongoing mitigation efforts at national and international levels. These findings, derived from an extensive analysis of primary and secondary data, highlight the structural, operational, and policy-level issues contributing to the recurring container crises in the post-pandemic global economy, with specific reference to the Indian logistics and maritime sector.

5.1.1 Imbalance in Global Trade Flows

One of the most critical findings is the persistent imbalance in global trade flows, especially between major manufacturing hubs in Asia and consumption-driven economies in North America and Europe. Countries like China, which export far more than they import, accumulate a surplus of empty containers. Conversely, countries like India, which often experience higher import volumes than exports in certain sectors, face a deficit of empty containers, particularly in inland locations. This asymmetry results in inefficient container repositioning, often forcing exporters to wait for containers to be relocated from distant ports or international locations, increasing both time and cost.

5.1.2 Dependence on Imported Containers

India's heavy reliance on imported ISO containers, primarily from China, has emerged as a strategic vulnerability. As per multiple industry sources, India imports over 80% of its containers, and any disruption in Chinese production or export policies severely impacts Indian container availability. The COVID-19 pandemic and subsequent

lockdowns in China exposed this dependency, as Chinese manufacturers prioritized their domestic and high-volume international clients, delaying deliveries to other countries. This underscores the urgent need for indigenous container manufacturing capabilities under initiatives like Atmanirbhar Bharat.

5.1.3 Port Congestion and Operational Bottlenecks

A major operational finding is the prevalence of port congestion and inefficiencies at major container terminals, both globally and in India. Ports such as Los Angeles, Singapore, Mundra, and Nhava Sheva have experienced vessel delays, increased turnaround times, and container yard congestion. These issues are often linked to labor shortages, outdated handling equipment, poor digital coordination, and lack of extended working hours. In India, the lack of port automation and real-time cargo visibility systems contributes to delays in container clearance and movement, especially during peak seasons.

5.1.4 Inefficient Container Repositioning and Inland Transport

The inefficiency in container repositioning—especially the return of empty containers from inland container depots (ICDs) to ports—is a key issue identified in the Indian logistics landscape. High rail and road freight costs, lack of multimodal transport networks, and limited availability of rail rakes contribute to delays in repositioning containers, which exacerbates shortages at major export hubs. Furthermore, the lack of digital container tracking systems limits the visibility of container locations, leading to mismanagement and underutilization.

5.1.5 Surge in Freight Rates and Export Uncertainty

The container shortage has had a direct economic impact on supply chains, particularly in the form of skyrocketing freight rates. During the peak of the pandemic and immediately after, the average cost of shipping a 40-foot container from China to Europe or the US increased by 4 to 6 times. Indian exporters faced similar cost pressures, leading to cancellation of orders, loss of competitiveness, and liquidity issues—especially among MSMEs and agricultural exporters. The inability to secure containers at the right time and at affordable rates created a high degree of uncertainty in global trade planning.

5.1.6 Gaps in Policy Coordination and Private Sector Involvement

While India has initiated several promising policy responses, such as the Sagarmala programme, Unified Logistics Interface Platform (ULIP), and PLI scheme for container manufacturing, the implementation is still in its nascent stages. The findings reveal a lack of coordination between central ministries, private port operators, and logistics service providers, which leads to fragmented efforts and underutilization of public investments. For instance, while ICDs and dry ports have been promoted, many suffer from low cargo throughput due to lack of integration with coastal and rail networks.

5.1.7 Technological Gaps in Logistics Visibility

Another finding is the limited penetration of digital technologies in India's port and container management systems. Global ports like Rotterdam and Singapore have implemented AI-based predictive models and blockchain-based smart contracts for container tracking and planning. In contrast, many Indian ports still depend on manual documentation, fragmented EDI systems, and legacy communication protocols. This results in reduced agility, lack of transparency, and inefficient container turnaround management.

5.1.8 Positive Impact of Recent Mitigation Strategies

Despite the challenges, some mitigation strategies have yielded measurable results. For instance, the launch of ULIP under the National Logistics Policy has enabled data integration across over 30 systems, improving cargo visibility. Similarly, port-led development under Sagarmala has improved cargo handling capacity and first/last-mile connectivity in several regions. Pilot projects involving container tracking using RFID and GPS have also shown potential in reducing idle time and theft risk. These initial successes point toward the long-term viability of integrated digital and infrastructure-based solutions.

5.1.9 Stakeholder-Specific Impact and Response

Finally, the impact of container shortages varies among stakeholders. Shipping lines benefit from higher spot rates but face criticism over blank sailings and poor schedule reliability. Freight forwarders and NVOCCs struggle to secure space and containers, often paying premium charges. Exporters, particularly in textiles, electronics, and perishables, face the brunt of these shortages through order delays and demurrage costs. The lack of a coordinated stakeholder framework has led to a trust deficit in the logistics

ecosystem, which must be addressed through structured engagement mechanisms and joint planning forums.

5.2 CONCLUSION

The phenomenon of container shortage has emerged as one of the most pressing challenges facing global and Indian supply chains in recent years. Initially triggered by the unprecedented disruption caused by the COVID-19 pandemic, the shortage has since revealed deeper structural vulnerabilities within the international trade and logistics ecosystem. This study has undertaken a comprehensive analysis of the causes and mitigation strategies associated with container shortages, based on primary and secondary research and documented industry data.

The findings clearly show that the shortage of containers is not merely a result of physical scarcity, but rather a complex issue stemming from trade imbalances, port congestion, inadequate container repositioning systems, high dependency on container imports, and logistical inefficiencies. In India, these challenges are compounded by limitations in infrastructure, lack of seamless intermodal connectivity, and a relatively underdeveloped domestic container manufacturing base. The ripple effects of these inefficiencies have been felt across various industries—particularly export-oriented sectors—through increased freight costs, shipment delays, and reduced global competitiveness.

Moreover, the analysis highlights that policy and operational gaps continue to hinder a swift and coordinated response to such crises. While government initiatives such as the National Logistics Policy, Sagarmala programme, and Unified Logistics Interface Platform (ULIP) mark a strategic intent to modernize the logistics framework, their practical impact is still evolving and requires stronger implementation, integration, and stakeholder participation.

On the positive side, the research identifies a growing recognition among stakeholders—governments, logistics providers, and trade bodies—of the need to shift from reactive to proactive approaches. The emphasis on digitalization, capacity enhancement, domestic container production, and multimodal logistics development are promising trends that, if scaled and sustained, could build long-term supply chain resilience.

In short, resolving container shortages demands a holistic and coordinated approach, combining policy reforms, infrastructure investment, private sector engagement, and technology integration. The focus should not only be on short-term alleviation measures but also on building an agile and future-ready logistics ecosystem. For India, this is an opportune moment to reinforce its position in global trade by prioritizing supply chain resilience as a strategic economic objective. By addressing the systemic causes of container shortages and implementing targeted mitigation strategies, India can ensure smoother trade flows and more reliable export performance in the years ahead.

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ANNEXURE

Questionnaire

1. Name

2. Working company name?

3. Years of experience

4. Can you briefly describe your role and experience in the shipping/logistics/supply chain industry?

- Operations
- Planning/Strategy
- Documentation/Customs Clearance
- Freight Forwarding/Logistics
- Port/Terminal Management
- Other:

5. Which region(s) or trade lanes are you primarily involved with? (Select all that apply)

- Asia-Europe
- Transpacific
- Intra-Asia
- Asia-Middle East
- india–Africa
- Coastal/Short-Sea Shipping
- Other:

6. From your perspective, what were the main causes of the recent global container shortages? (Select top 3)

- COVID-19 pandemic
- Port congestion
- Trade imbalances
- Blank sailings
- Labor shortages/port strikes
- Poor container repositioning
- Surge in e-commerce

- Customs and regulatory delays
- Other:

7. To what extent did the COVID-19 pandemic contribute to the container imbalance?

- Very significantly
- Moderately
- Slightly
- not at all

8. How significant was the role of port congestion in causing container shortages?

- Very Significant
- Moderate
- Minor
- No Impact

9. What impact did blank sailings and supply-demand mismatch have on container availability?

- High impact
- Medium impact
- Low impact
- No impact

10. Have labor shortages or port strikes affected container flow in the regions you operate in?

- Yes – Major delays
- Yes – Minor delays
- No significant impact
- Not applicable in my region

11. How do you think trade imbalances between exporting and importing countries contributed to this issue?

- A major factor
- A minor factor
- No effect
- Not Sure

12. Have there been any policy-related or regulatory challenges affecting container movement? (Select all that apply)

- Customs clearance delays
- Local lockdowns/COVID restrictions
- Documentation issues
- Lack of coordination among authorities
- No major issues faced
- Other:

13. What role did the increase in e-commerce demand and inventory stockpiling play?

- Significant role
- Moderate role
- Limited role
- No Role

14. In your experience, were there any technological or operational inefficiencies contributing to container shortages?

- Yes – Poor tracking systems
- Yes – Terminal handling delays
- Yes – Lack of real-time visibility
- No noticeable inefficiencies
- Other:

15. Do you think poor container tracking and repositioning strategies are to blame for some part of the problem?

- Yes – A major reason
- Yes – A minor reason
- No
- Not Sure

16. Were specific types of containers more affected than others? (Select all that apply)

- 40-ft High Cube
- 20-ft Standard
- Reefers (Refrigerated Containers)
- Tank Containers
- Special Equipment (Flat Racks/Open Tops)
- No particular type was more affected

17. What measures do you believe could help prevent container shortages in the future? (Select all that apply)

- Improved container tracking & repositioning tech
- Greater carrier-port collaboration
- Increased container manufacturing
- Strategic inland depots/hubs
- Reforms in customs/regulations
- Better demand forecasting
- Other:

18. Are there any recent strategies your organization or partners adopted to cope with these disruptions? (Select all that apply)

- Leased extra containers
- Shifted to alternative ports/routes
- Collaborated with digital platforms for visibility
- Increased buffer stock/inventory
- Improved repositioning practices
- No new strategies adopted
- Other:

<https://docs.google.com/forms/d/e/1FAIpQLSeE32aU8nSeMXsgcVryQulnkUJHbMjChJsdIDtCBRpTuXFhSw/viewform?usp=dialog>

