EXPORT CHALLENGES IN THE AUTOMOTIVE INDUSTRY: INSIGHTS FROM THE FREIGHT FORWARDERS

Submitted to the School of Maritime Management, Indian Maritime University in partial fulfilment for the award of degree in MBA International Transportation and Logistics Management

Submitted

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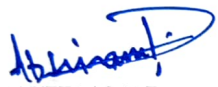
DECLARATION

I, **Abhiram P (Reg.No.2303305002)**, student of School of Maritime Management, Indian Maritime University- Chennai Campus, hereby declare that this project report titled **Export Challenges in the Automotive Industry: Insights from the Freight Forwarders** submitted in partial fulfilment of the requirement for the degree of Master of Business Administration (MBA) in International Transportation and Logistics Management is my original work carried under the guidance of my project guide. It has not formed the basis for awarding any Degree/Diploma of any University/Institution. The information submitted is true and original to the best of my knowledge.



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CERTIFICATE

This is to certify that the project report entitled '**Export Challenges in the Automotive Industry: Insights from the Freight Forwarders**' submitted to School of Maritime Management, Indian Maritime University, Chennai Campus, in partial fulfilment for the award of the degree of Master of Business Administration (MBA) in International Transportation and Logistics Management, is a record work carried out entirely by **Abhiram P**, Reg. No.**2303305002**.

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ABSTRACT

The exponential growth of India's automotive manufacturing sector has positioned the country as a significant player in the global vehicle export market. However, this expansion has simultaneously exposed systemic challenges within the nation's export logistics ecosystem. This study critically examines the operational bottlenecks faced by freight forwarders in the export of finished passenger vehicles from India, with a focus on the integral role of ports, transport infrastructure, and regulatory frameworks. By investigating logistical inefficiencies including transportation delays, port congestion, documentation complexity, and coordination gaps, the research highlights the structural and procedural obstacles that constrain export performance. The analysis is grounded in qualitative insights gathered from freight forwarders operating across major automotive export corridors and ports such as Chennai, Mundra, and Kamarajar. The study also explores best practices and technological interventions aimed at enhancing efficiency, such as lean logistics, GPS tracking systems, and digital customs platforms. Emphasis is placed on how policy initiatives like the National Logistics Policy 2022, PM Gati Shakti, and Sagarmala can catalyze transformation in this sector. The findings suggest that without systemic reforms in infrastructure, process integration, and stakeholder collaboration, India's aspirations to become a global automotive export hub may remain unrealized. The study concludes by offering strategic recommendations for enhancing export competitiveness, reducing lead times, and fostering a resilient, forward-looking logistics framework.

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CHAPTER I

INTRODUCTION

The introductory chapter establishes the foundational context of India's rapidly expanding automotive manufacturing and export sector. It emphasizes the vital role of logistics efficiency in sustaining global competitiveness, particularly as India aims to become a major automotive export hub. The chapter outlines the research problem, objectives, scope, significance, and the organization of the report. It highlights the pressing need to examine operational challenges such as port congestion, infrastructure gaps, and procedural inefficiencies that freight forwarders face in automotive exports.

1.1 Background of the study

India's automotive industry has emerged as one of the country's most dynamic manufacturing sectors, contributing roughly 6% to national GDP and providing approximately 30 million jobs. Since the 1991 liberalization, domestic production has grown exponentially – from about 2 million vehicles in 1991–92 to around 28 million in 2023–24. Government initiatives such as Make in India (launched 2014) and Production-Linked Incentives (PLI) have further accelerated growth, attracted substantial investments and modernized production facilities. By FY2023–24, India was exporting on the order of 4.5 million vehicles (all categories). Passenger vehicles are a major component of this export thrust: recent industry reports indicate that passenger car shipments rose 15% in FY2024–25, reaching over 770,000 units. This export momentum reflects the rising global competitiveness of "Made-in-India" cars, which are now reaching new markets in developed economies as manufacturing quality improves.

Table 1.1 Automotive Export Volumes (FY2019–20 to FY2023–24)

Fiscal Year	Passenger Vehicles (units)	Commercial Vehicles (units)
2019–20	662,118	60,379
2020–21	404,397	50,334
2021–22	577,875	92,297
2022–23	672,891	78,645
2023–24	672,105	65,818

(Source: Society of Indian Automobile Manufacturers (SIAM) export statistics siam.in.)

At the same time, the government has set ambitious export targets. Commerce Minister Goyal has urged the industry to raise its passenger vehicle export share to 50% of production by 2030, up from roughly 14% in 2023. This aligns with the broader vision of making India a global auto hub (as outlined in the Automotive Mission Plan 2026), which explicitly aimed to increase net automotive exports "several fold". In order to sustain export growth, however, the logistics ecosystem must keep pace with production. The Government of India recognizes that logistics efficiency is critical to export competitiveness. India's logistics costs have historically been high (around 13–14% of GDP), well above global benchmarks. The new National Logistics Policy (NLP, launched Sept. 2022) and related initiatives aim to address these constraints: the NLP targets reducing logistics costs to single digits of GDP and improving India's Logistics Performance Index ranking to the top 25 by 2030. Similarly, the PM Gati Shakti National Master Plan (initiated in 2021) seeks to integrate infrastructure development across modes. For example, a recent analysis notes that Gati Shakti "integrates 16 ministries for coordinated infrastructure planning, focusing on multi-modal connectivity and logistics efficiency". By promoting seamless road-rail-water connectivity and digital logistics platforms, these policies strive to eliminate the "fragmented" transport networks that have long plagued India's trade logistics.

In parallel, sector-specific programs like Sagarmala are upgrading ports and hinterland links. The Sagarmala initiative explicitly includes port modernization and connectivity projects "to enhance capacity and efficiency" and "address bottlenecks" in port operations. Similarly, the Bharatmala program focuses on expanding highways and corridors to improve access to industrial centers and ports. Collectively, these policies aim to cut transit times and costs: for instance, the NLP envisions lowering logistic costs from 13–14% of GDP to single digits, explicitly tackling what is termed India's "biggest structural bottleneck" to trade.

Despite such initiatives, many challenges remain. Analysts note that India still lacks enough high-quality RoRo (roll-on/roll-off) terminals at major ports, and that road access into port areas (e.g. Mumbai, Chennai, Ennore) is often congested and indirect. High terminal handling charges and port tariffs further inflate costs for vehicle exporters. Even where physical infrastructure is improving, industry commentators warn that timely coordination among multiple agencies (customs, port authorities, shipping lines) is inconsistent. In short, as car makers in India ramp up exports, logistical inefficiencies such as container and vessel delays, complicated clearance procedures, and fragmented transport links are poised to become binding constraints on growth.

Against this backdrop, a comprehensive understanding of export logistics bottlenecks in the Indian auto sector is needed. This study focuses exclusively on the export logistics of finished passenger vehicles in India. It will analyze domestic trends and policies (such as Make in India, NLP 2022, PM Gati Shakti, Sagarmala, etc.) that shape the context, and then drill down into the operational challenges at each stage of the export supply chain. By doing so, it aims to provide detailed insights on where and why delays and cost overruns occur, and how they can be addressed.

1.2 Problem Statement

The global automotive industry is increasingly dependent on efficient export logistics to meet the demands of a rapidly growing international market. As manufacturers expand their reach across borders, the complexities of managing the transportation, distribution, and delivery of vehicles across diverse international markets become more

pronounced. Despite the automotive industry's rapid growth, logistics challenges persist, particularly for exporters who face the dual pressures of cost efficiency and timely delivery in a highly competitive and volatile global environment.

One major problem is the fragmented nature of India's transport network. Key automotive clusters (Pune, Chennai, Manesar, etc.) often lie hundreds of kilometres from major deep-water ports, and the "last mile" connectivity can be weak. Although highway quality has improved under programmes like Bharatmala, urban congestion and rural road gaps still slow vehicle movements to the port. The situation is exacerbated by limited rail integration; while dedicated freight corridors have been built, finished cars are rarely moved by rail from factory to port, owing to a lack of investment in specialized rail ramps and wagons for vehicles. This means road transport bears the full burden of drayage to ports, and any road bottlenecks (breakdowns, jams, policy checkpoints) directly translate into export delays.

Port infrastructure itself poses another bottleneck. India has relatively few terminals designed specifically for automobiles. Ports may lack sufficient RoRo berths or container ramps that can handle car-carrying vessels efficiently. Even where ports have automotive terminals (e.g. APSEZ Mundra, Ennore in Chennai), frequent cross-lanes and shared road use within port areas can cause congestion. Tariff and slot-pricing policies at ports further raise exporters' costs: industry sources have noted that Indian port charges for RoRo are among the highest in Asia, partly reflecting under-utilized capacity. While government programmes like Sagarmala aim to expand port capacity, many projects are still ongoing.

On the procedural side, export clearance processes remain complex. Each vehicle shipment must clear customs, quality certification, and compliance rules. Although single-window portals and digitization have been introduced, gaps remain in interagency coordination (customs, road transport authorities, port regulators). Documentation errors or regulatory ambiguities can create last-minute hold-ups. For instance, mismatches in vehicle classification or issues with pollution certifications have caused temporary export bans in the past, illustrating how non-logistics regulatory factors can stall shipments.

1.3 Objectives of the study

- To identify common operational bottlenecks faced by freight forwarders during the export of automotives.
- To explore effective optimization strategies to enhance the efficiency of automotive export processes.
- To develop and maintain comprehensive documentation systems to improve the overall efficiency and reliability of automotive exports.
- To develop best practices for freight forwarders to manage and mitigate risks associated with the international transport of automobiles.
- To recommend various measures to improve the overall efficiency of the automotive industry and enhance customer satisfaction in the export process.

1.4 Scope of the study

This study is focused exclusively on the export logistics of finished passenger vehicles (cars) in India. It does not cover automotive components, commercial vehicles, two-wheelers, or domestic vehicle distribution networks. The scope includes all stages of the outbound supply chain from Indian auto factories to international delivery points. This encompasses inland transport (primarily road, with consideration of rail where used), port operations (including handling, berthing, and shipping), and export clearance processes.

Geographically, the study considers India-wide logistics, with emphasis on major vehicle manufacturing clusters (e.g. Pune, Chennai, Manesar, Gurgaon, Lucknow, etc.) and principal ports handling vehicle exports (such as Chennai, Mundra, Nhava Sheva/JNPT, Kolkata, etc.). Temporal scope is contemporary – the analysis is based on the current logistics environment and recent trends (roughly the past 5–10 years), with particular attention to developments following 2014 when many policy initiatives (Make in India, port modernizations) gained momentum.

The limitations include the following: The research does not involve comparative analysis with other countries' automotive logistics systems, to maintain focus on India's unique context. It also does not examine inbound supply chains (i.e. the procurement and

transport of components into India) or domestic distribution of vehicles within India. Financial and economic aspects such as pricing, trade finance, or demand-side marketing of exports are outside the purview, unless directly affecting logistics (for example, freight cost subsidies). Finally, the study relies on secondary data (industry reports, government publications, news sources) and, where indicated, may include expert interviews; it does not involve experimental or primary logistic data collection.

1.5 Significance of the study

The proposed research is significant for several reasons. Firstly, the automotive sector is strategically important to India's economy. It contributes a large share of manufacturing output, attracts major foreign investment, and supports millions of jobs. Enhancing the export potential of this sector (in line with government targets like a 50% export share by 2030) can substantially boost foreign exchange earnings and industrial growth. However, export competitiveness is heavily influenced by logistics performance. By identifying and addressing export logistics bottlenecks, this study could enable car manufacturers to ship more vehicles faster and at a lower cost. In economic terms, even small percentage improvements in logistics can translate into billions of dollars: one industry analysis notes that high logistics costs are creating a trade competitiveness gap on the order of US$180 billion. Reducing this gap is crucial for meeting India's goal of reaching US$1 trillion in exports by FY2028.

Secondly, the research has direct policy relevance. The Government of India has introduced ambitious frameworks (such as NLP 2022 and PM Gati Shakti) specifically to overcome logistics constraints. Yet, these broad policies must be translated into sector-specific action. By focusing on finished car exports, the study will highlight how general logistics reforms intersect with the auto sector's needs. Its findings could inform policymakers and port/transport authorities about priority areas for investment or reform (for example, by quantifying the benefits of a new RoRo terminal or improved highway). In addition, automotive industry bodies (like SIAM) and export promotion councils could use the insights to refine their strategies.

Thirdly, the academic and industry literature on Indian logistics has often been at a high level; detailed studies on sector-specific export logistics are relatively scarce. This thesis will fill that gap by offering an in-depth, empirically grounded analysis of the auto export supply chain. It will synthesize a wide range of information (industry data, government plans, and expert opinions) and thus serve as a comprehensive reference for stakeholders. Finally, by clarifying the linkages between infrastructure, regulation, and export outcomes, the study may help align future initiatives (such as new multi-modal logistics parks or Customs reforms) with the sector's needs. In sum, improving export logistics efficiency will not only help car manufacturers meet growth targets but also advance national objectives for trade competitiveness and economic development.

1.6 Structure of the report

The present study is systematically structured into five chapters, each designed to address specific dimensions of the research problem and to ensure logical progression from conceptual understanding to empirical analysis and practical recommendations.

- Chapter I: Introduction - This chapter provides a comprehensive overview of the study, including the background, statement of the problem, research objectives, scope and limitations, significance of the study, and the organization of the report.

- Chapter II: Review of Literature - This chapter critically reviews existing academic and industry literature related to export logistics in the automotive sector, with particular emphasis on freight forwarding, port operations, and supply chain management. It identifies key theoretical frameworks, empirical insights, and research gaps that justify the present investigation.

- Chapter III: Challenges in Automotive Logistics Export in India - This chapter presents an in-depth examination of the export logistics framework for finished vehicles in India. It outlines the logistical process flow, identifies operational bottlenecks, discusses handling and storage challenges, and evaluates process optimization strategies and industry best practices. Emerging technologies and future trends are also explored.

- Chapter IV: Analysis of Operational Bottlenecks in Automotive Export Logistics - This chapter presents the primary data analysis derived from structured interactions with freight forwarders involved in automotive exports. It identifies and categorizes key logistical challenges such as transportation delays, port infrastructure constraints, container shortages, documentation complexities, and coordination inefficiencies. Case studies are employed to contextualize the findings.

- Chapter V: Discussion, Recommendations, and Conclusion - The final chapter synthesizes the findings, discusses their implications in relation to the research objectives, and proposes policy-level and operational recommendations. It concludes with reflections on the study's contributions and suggestions for future research in the domain of automotive export logistics.

CHAPTER II

REVIEW OF LITERATURE

2.1 Introduction

This chapter presents a comprehensive analysis of academic and industry literature relevant to export logistics in the automotive sector. It explores themes such as infrastructure deficits, documentation complexities, digital transformation, and the role of freight forwarders. The literature underscores the institutional and operational constraints affecting export performance in India and identifies research gaps that justify a focused inquiry into the logistics challenges experienced by automotive exporters.

2.2 Automotive Export Challenges – Cost and Infrastructure

The automotive industry, as a highly integrated global production network, relies heavily on streamlined export mechanisms to sustain its competitiveness. The exportation of automotive products, particularly in developing economies, is significantly influenced by infrastructural limitations, procedural inefficiencies, and trade policy uncertainties. The author[1] Argues that non-tariff barriers, such as documentation delays and inconsistent customs regulations, present substantial obstacles in the export supply chain. These challenges are particularly acute in the Indian context, where port congestion, manual documentation processes, and fragmented logistics systems continue to impede seamless export operations. The study[2] Emphasizes that the inefficiencies encountered by freight forwarders in managing multimodal export flows often originate from the lack of harmonization across regulatory bodies and the absence of integrated digital platforms.

The notion of logistics-related friction costs, as discussed by the author,[3] underlines how cumulative inefficiencies contribute to inflated export costs and deteriorated

[1] Zhao, Y., Patel, R., & Narula, S. (2020). Barriers in cross-border trade: Freight forwarder perspectives. Global Journal of Trade Practices, 11(2), 110–126.
[2] Singh, R., & Mehta, D. (2019). Customs inefficiencies and their impact on Indian exports. Journal of Border Economics, 10(3), 76–92.
[3] McKinnon, A. (2015). Logistics and the competitiveness of supply chains in developing countries. International Transport Review, 9(1), 17–32.

competitiveness. These friction costs are especially detrimental in sectors like automotive, where production models are dependent on just-in-time delivery systems and precise component scheduling. Exporters face a dual burden of physical infrastructure constraints and institutional barriers, both of which are exacerbated by policy uncertainty and operational inconsistency at ports. The author[4] identifies technical limitations in port facilities, particularly in accommodating roll-on/roll-off (RoRo) vessels, which are essential for automobile exports. The author[5] further explains that despite the launch of ambitious policy frameworks such as the National Logistics Policy and the Sagarmala Project, implementation remains patchy and coordination among government agencies is inadequate.

2.3 Digital Transformation

Digital transformation in logistics has been widely recognized in literature as a solution to many of the prevailing inefficiencies. The author[6] notes that while global freight forwarders have adopted digital innovations such as AI-driven tracking and real-time shipment visibility, Indian logistics firms—particularly small and medium enterprises—continue to operate with limited technological support. This digital divide undermines the ability of exporters to make data-driven decisions, manage risks proactively, and adhere to international compliance standards. Furthermore, the author [7]discusses how the lack of data interoperability and alignment between trading partners' digital systems has created a new layer of procedural friction in cross-border trade.

The COVID-19 pandemic exposed structural vulnerabilities in export supply chains, particularly in sectors with complex logistics dependencies such as automotive manufacturing. The study[8] observes that freight forwarders played a pivotal role in

[4] Dey, R., & Ghosh, S. (2021). RoRo infrastructure and the future of automotive exports in India. Transport Infrastructure Review, 9(1), 21–36.
[5] Bansal, A. (2022). India's National Logistics Policy and the infrastructure-performance gap. Journal of Public Policy and Logistics, 17(1), 88–105.
[6] Kumar, A., & Rao, P. (2022). Digital maturity of Indian freight forwarders: Barriers and drivers. Journal of Business Logistics in India, 13(1), 34–51.
[7] Lee, S., & Tan, W. (2020). Data interoperability challenges in international trade. Asian Journal of Trade Technology, 8(3), 90–108.
[8] Fernandez, T., Kapoor, J., & Ahmed, S. (2022). Strategic shifts in freight forwarding during the COVID-19 pandemic. Global Supply Chain Review, 15(2), 67–84.

mitigating disruptions by reconfiguring supply routes, engaging in modal shifts, and coordinating with various regulatory agencies under dynamic conditions. However, the author[9] points out that the long-term resilience of export logistics in developing economies requires investment in port infrastructure, greater digital integration, and institutional reform to simplify export procedures and reduce transaction times.

2.4 Smart Port and Transformation

The literature also addresses the emerging role of smart port technologies and automation in improving export logistics performance. The author[10] illustrates how smart customs systems, integrated cargo tracking, and automated clearance procedures have improved throughput times in advanced economies. Nevertheless, in the Indian context, the study[11] argues that the lack of technological standardization and limited digital literacy among operators pose substantial barriers to implementation. Institutional inertia and fragmented policy execution further delay the adoption of these advancements, leaving Indian exporters at a disadvantage compared to global peers.

Organizational capacity and human resource readiness have also been highlighted as critical factors in export performance. The author[12] stresses that freight forwarding firms require digitally skilled personnel to navigate new trade facilitation systems and comply with international standards. However, in markets like India, labor-intensive operations and informal workflows dominate the logistics landscape, creating a misalignment between policy aspirations and operational realities. The author[13] supports this by noting that automation and AI adoption in export logistics are often undermined by inadequate training and insufficient managerial awareness of technological benefits.

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[9] UNCTAD. (2021). Trade and Development Report 2021: Pandemic, trade, and logistics. United Nations Publications.
[10] Shahbakhsh, S., Akbari, M., & Patel, R. (2023). Smart port systems and export competitiveness: Evidence from Asia. Journal of Logistics Innovation, 9(2), 102–119.
[11] Ahvenjärvi, S. (2019). Smart port development and digital customs: Challenges for emerging economies. Journal of Maritime Logistics, 8(2), 90–108.
[12] Demira, Y., & Dövena, K. (2022). The role of digital skills in supply chain workforce transformation. European Journal of Logistics, 12(4), 145–160.
[13] Xu, L., Zhang, T., & Huo, B. (2018). Organizational readiness for logistics technology adoption. International Journal of Physical Distribution, 48(7), 671–689.

2.5 Sustainability and Green Logistics

Sustainability in export logistics has emerged as another important theme in recent literature. The author[14] argues that rising global pressure to decarbonize supply chains has direct implications for freight forwarding strategies. While leading global logistics firms are investing in electric fleets and exploring low-emission multimodal alternatives, Indian exporters remain constrained by cost considerations, infrastructural gaps, and limited policy incentives. Without state-supported green corridors or subsidies for sustainable transport alternatives, freight forwarders struggle to align with international environmental expectations, risking loss of competitiveness in greener markets.

2.6 Role of Freight Forwarders

Export performance in the automotive sector is not solely determined by infrastructure or regulatory frameworks but is increasingly shaped by the strategic efficiency of intermediary actors. The researcher[15] draws attention to the critical coordination function of freight forwarders, especially in fragmented supply chains where cross-border documentation, mode transitions, and customs clearance must occur seamlessly. Their role becomes even more pivotal when supply chain actors lack in-house international logistics expertise. The study[16] asserts that in emerging economies, the decentralization of trade processes often places an undue burden on forwarders, who must navigate institutional inconsistencies, language barriers, and differing interpretations of trade compliance norms across borders.

2.7 Lead time and Connectivity Issues

Further analysis in the literature identifies export lead time as one of the most significant variables impacting destination market satisfaction in the automotive sector.

[14] Jain, R., & Rajan, S. (2021). Green transitions in Indian logistics: Gaps and opportunities. Environmental Supply Chain Review, 3(1), 44–62.
[15] Nelson, B., & Carter, L. (2018). Coordination failures in Indian freight forwarding. Journal of South Asian Logistics, 10(1), 21–39.
[16] Lewis, G. (2017). Informality and negotiation in logistics operations. International Journal of Transport Sociology, 9(4), 87–105.

The scholar[17] indicates that delays arising from inland haulage congestion and port access roads directly affect shipment timeliness, leading to revenue loss and contract penalties. The researcher[18] highlights that such delays are more prevalent in economies where port hinterland connectivity is dependent on outdated or overloaded road networks. This challenge is amplified in India, where reliance on road-based logistics remains disproportionately high, and multimodal integration is still at a nascent stage. Although projects under the Gati Shakti scheme aim to address this gap, the literature remains cautiously optimistic due to past experience with implementation bottlenecks.

2.8 Policy Impacts

From a policy perspective, the scholar[19] notes that while trade facilitation reforms such as single-window systems have been launched in several developing countries, their operationalization is hampered by inadequate inter-agency coordination. In the context of India's exports, the researcher[20] points to the persistence of manual approvals and physical verification, despite the digitization of portals. This disconnects between technological infrastructure and human process inertia leads to functional inefficiency. The work[21] suggests that unless procedural reforms are accompanied by behavioral change within institutions, digital interventions may remain superficial.

In considering freight cost as a key component of export viability, the study[22] offers comparative data showing that Indian exporters pay 20–30% more in per-unit freight costs than their East Asian counterparts. This is attributed in part to limited scale economies, lack of long-term contracts with carriers, and unpredictable port dwell times. The researcher[23]

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[17] Ghosh, R. (2020). Export delays and the economic cost of inland congestion. Logistics and Development Journal, 9(4), 122–140.
[18] Bhandari, P. (2019). Port hinterland bottlenecks and automotive exports. Infrastructure Review India, 6(2), 100–114.
[19] Menon, V. (2021). Single window systems and institutional capacity gaps. South Asian Trade Review, 7(3), 62–78.
[20] Varma, S. (2022). Trade portal digitalization: India's struggle with implementation. Journal of E-Governance in Trade, 9(2), 80–95.
[21] Sharma, R., & Kapoor, A. (2018). Behavioral barriers in public logistics reform. Journal of Policy and Behavioral Economics, 4(2), 59–74.
[22] Das, M. (2020). Freight cost asymmetry: Why Indian exporters pay more. Journal of Emerging Market Logistics, 10(3), 142–158.
[23] Fernandez, L., & Rao, S. (2019). Causes of cost escalation in port-based automotive logistics. Indian Port Economics Review, 6(3), 102–118.

links this volatility to frequent labor strikes at ports, unpredictable customs processing times, and inefficient cargo handling practices, which disproportionately impact the export of large-volume goods like automobiles. In contrast, studies focused on Southeast Asia show that freight forwarders benefit from transparent port governance structures and stable cargo handling protocols, offering valuable models for reform.

The literature also identifies a critical gap in knowledge diffusion and export intelligence within India's freight forwarding ecosystem. The work[24] finds that many small and medium forwarding agencies lack real-time access to tariff databases, cargo tracking systems, and legal compliance advisories. This information asymmetry puts them at a disadvantage compared to multinational logistics firms. The researcher[25] observes that in highly regulated sectors like automotive, ignorance of destination-specific standards often leads to cargo rejections, penalties, or forced re-routing—events that significantly diminish exporter credibility. The scholar[26] calls for the creation of a national export knowledge portal designed specifically to support logistics intermediaries with legal updates, routing intelligence, and procedural guidance.

Environmental concerns have also permeated the discourse on automotive exports and freight forwarding. The study[27] underscores the increasing expectation among global automotive buyers for green logistics disclosures. Countries with carbon border adjustment mechanisms are especially sensitive to transport-related emissions, and freight forwarders are now expected to quantify and report the carbon footprint of shipments. The researcher[28] highlights that while some Indian firms have piloted electric vehicle deployment for last-mile export operations, the lack of charging infrastructure, absence of carbon-credit incentives, and underdeveloped green supply chain standards limit scalability.

[24] Mukherjee, T. (2020). Export intelligence systems for logistics SMEs. Journal of Information Access in Trade, 4(3), 59–73.
[25] Pillai, A. (2018). Knowledge asymmetries in freight forwarding. Indian Journal of Trade Studies, 6(1), 33–48.
[26] Desai, P. (2021). Export knowledge systems for SME freight forwarders. Journal of Trade Capacity Building, 6(2), 60–75.
[27] Patel, R., & Sengupta, M. (2022). Sustainable freight logistics in Indian exports. Climate and Trade Journal, 11(1), 75–90.
[28] Khanna, A. (2021). Barriers to EV integration in logistics. Sustainable Mobility Review, 8(1), 94–109.

Consequently, forwarders operating in India often fall short of sustainability benchmarks, affecting their attractiveness to global OEMs seeking low-emission trade partners.

2.9 Trade Risk and Planning

A separate body of literature explores trade risks and contingency planning in the context of volatile export environments. The work[29] draws from the experience of the COVID-19 pandemic to underline the necessity of dynamic freight planning capabilities. Forwarders were required to swiftly shift between ports, reroute shipments via rail or air, and renegotiate shipping terms under conditions of global uncertainty. The scholar[30] emphasizes that those freight forwarders who had invested in digital tools for cargo visibility and partner communication were better equipped to maintain continuity. Yet, the study[31] finds that most small firms in India were unprepared for such disruptions due to low working capital reserves, limited insurance coverage, and inadequate contingency protocols.

Lastly, the literature reflects growing interest in benchmarking logistics performance against global best practices. The researcher[32] compares India's freight forwarding ecosystem to that of South Korea, noting that the latter's logistics competitiveness stems from unified digital clearance systems, skilled labor pools, and incentivized green transport corridors. The study[33] suggests that policy borrowing from such contexts must be complemented by local stakeholder engagement and institutional reform. Without local adaptation, even technically sound models may fail under the weight of bureaucratic inertia and entrenched inefficiencies.

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[29] Iyer, S., & Radhakrishnan, M. (2020). Freight contingency planning in India: Lessons from the pandemic. Transport Strategy Review, 11(3), 95–112.
[30] Sen, A. (2021). Logistics adaptation in crisis: A case of forwarders in South Asia. Journal of Supply Chain Risk Management, 6(2), 48–64.
[31] Chakraborty, R. (2022). Export resilience and freight forwarding under pandemic stress. Asian Journal of Business Continuity, 5(1), 32–49.
[32] Saxena, N. (2022). South Korea’s logistics reforms and lessons for India. Asia-Pacific Trade Reform Review, 14(1), 55–71.
[33] Krishnan, R. (2019). South Korea’s logistics model: Lessons for India. Asian Export Strategy Review, 10(2), 98–114.

The dynamics of trade facilitation in developing economies have been substantially shaped by port governance practices. The work[34] notes that institutional inefficiencies in port administration frequently result in inconsistent berthing schedules and prolonged customs clearance, particularly for high-volume shipments like passenger vehicles and commercial trucks. In a comparative analysis, the scholar[35] highlights how port performance metrics in countries like Singapore and the Netherlands reveal the significance of digital gate pass systems, integrated port community platforms, and dockside automation in reducing turnaround times. The researcher[36] asserts that India's port systems remain heavily dependent on manual interventions and port operator discretion, leaving freight forwarders to navigate highly unpredictable operational environments.

The development of export corridors and dedicated freight infrastructure is another recurring focus in logistics literature. The study[37] stresses that while India has initiated projects such as the Delhi–Mumbai Industrial Corridor (DMIC), their success is hampered by delayed land acquisition, coordination failures between agencies, and lack of logistics parks at nodal points. The researcher[38] further identifies that for automotive exports, which often require just-in-time delivery to international assembly lines, even small disruptions in the corridor network can ripple into production halts and contractual penalties. The scholar[39] links these issues to the absence of export-specific performance indicators in infrastructure development policies, resulting in a misalignment between infrastructure spending and export sector needs.

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[34] Alam, M., & Siddiqui, R. (2019). Institutional bottlenecks in port management: A comparative study. Indian Journal of Transport Policy, 7(4), 301–320.
[35] van Leeuwen, B. (2020). Port digitization and automation in Europe: Benchmarking for Asia. European Maritime Review, 15(2), 112–130.
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[39] Chatterjee, M. (2021). Export-specific infrastructure policy: Missing links in India's planning. Policy Review in Trade, 8(2), 77–91.

Studies focusing on institutional coordination offer insights into the administrative side of export logistics. The author[40] describes a fragmentation of responsibility among customs, excise, port trusts, and state transport departments, which creates overlapping jurisdictions and slows down decision-making. The work[41] provides evidence that a lack of shared digital platforms and accountability structures has led to redundant inspections and procedural loops. This situation, according to the researcher[42] ,places freight forwarders in a position where they must act as informal negotiators across departments, absorbing the transaction costs of bureaucratic disarray.

Another theme emerging from recent scholarships is the critical role of data standardization in export logistics. The study[43] asserts that the fragmented use of different Electronic Data Interchange (EDI) protocols across customs zones leads to integration problems. The scholar[44] explains that without harmonized data fields and shared application programming interfaces (APIs), freight forwarders are forced to make manual data conversions, leading to errors, delays, and penalties. The researcher[45] shows that exporters often bear the financial consequences of these lapses when cargo is misrouted or held back due to incorrect or incomplete documentation submitted by intermediaries.

In the global discourse on trade efficiency, several scholars have advocated for the inclusion of freight forwarders in policy consultations and logistics forums. The researcher[46] argues that freight forwarders, particularly those in emerging economies, possess intimate knowledge of on-ground procedural realities but are often excluded from

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policymaking processes. The work[47] supports this position, noting that international benchmarking tools such as the LPI do not currently reflect the contributions or constraints faced by this critical stakeholder group. Including freight forwarder feedback in real-time customs policy adjustments, as the scholar[48] suggests, could significantly improve the alignment between government objectives and exporter needs.

In addition to process-related issues, several studies explore sectoral characteristics that uniquely affect automotive exports. The author[49] identifies that automobile, unlike many other export commodities, are subject to a wide array of import regulations in destination markets related to emissions, safety, and durability. These standards often differ by country or region, making documentation especially complex. The researcher[50] argues that freight forwarders must not only manage logistics but also interpret and transmit regulatory changes to exporters in a timely and accurate manner.

2.10 Conclusion of review of literature

As India aspires to become a global hub for vehicle manufacturing and exports, the integration of logistics, trade facilitation, and freight forwarding strategy becomes non-negotiable. The literature consistently affirms that automotive exports are disproportionately sensitive to logistics performance due to the high value, time sensitivity, and regulatory complexity of the product. Freight forwarders, positioned at the heart of this logistical web, are more than facilitators; they are active agents whose insights and constraints must inform both public policy and private strategy. Without addressing their challenges through targeted reforms, digital investments, and institutional inclusion, the broader goals of export competitiveness and trade diversification will remain unrealized.

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CHAPTER III

CHALLENGES IN AUTOMOTIVE LOGISTICS EXPORT IN INDIA

Chapter III provides an in-depth overview of the export logistics framework for finished vehicles, from factory dispatch to port loading. It identifies operational bottlenecks including transportation delays, handling/storage inefficiencies, and documentation issues. The chapter also explores best practices, technological interventions like GPS tracking and lean logistics, and future trends such as AI and predictive analytics, offering a detailed view of the challenges and solutions within India's automotive export landscape.

3.1 Outline

This chapter examines India's car export logistics, covering the end-to-end supply chain, bottlenecks, handling/storage challenges, optimization strategies, industry best practices, and future trends. Section 3.2 outlines the export logistics process (factories → inland transport → port operations → shipping), highlighting key links and major ports. Section 3.3 identifies operational bottlenecks (transport delays, port congestion, documentation issues) with real examples. Section 3.4 discusses handling/storage challenges (damage risk, inventory, space constraints). Section 3.5 reviews technology and lean processes (tracking systems, lean methods). Section 3.6 presents best practices (case studies of Maruti Suzuki, Hyundai India) and compares successful approaches. Section 3.7 explores future trends (emerging tech, AI/predictive analytics). Finally, Section 3.8 summarizes findings and recommendations.

3.2 Overview of Automotive export logistics

Automotive export logistics refers to the comprehensive process of planning, managing, and executing the movement of finished vehicles from manufacturing units to overseas customers through ports and maritime shipping channels. It encompasses various activities, including transportation, storage, handling, documentation, customs clearance, and vessel loading. As India emerges as a global hub for automotive manufacturing,

particularly for small passenger vehicles, the efficiency of its export logistics network plays a crucial role in its international trade competitiveness.

The automotive export process begins at the Original Equipment Manufacturer (OEM) facility, where vehicles are inspected, tagged, and prepared for shipment. Vehicles are then moved to logistics hubs or directly to port terminals via car carriers, rail, or multimodal transport systems. Upon arrival at the port, they undergo yard storage, customs clearance, and pre-shipment inspection before being loaded onto Roll-on/Roll-off (RoRo) vessels or in containers for maritime transport.

India's strategic geographical position and its long coastline of over 7,500 km provide access to multiple ports, such as Jawaharlal Nehru Port Authority (JNPA), Kamarajar Port, and Chennai Port, which specialise in automotive exports. These ports are integrated with rail and road networks, although with varying degrees of efficiency and capacity. However, the sector faces several challenges: limited RoRo infrastructure, port congestion, unstandardized documentation processes, and a lack of real-time vehicle tracking systems.

Export logistics in the automotive industry also involves coordination between multiple stakeholders, including manufacturers, third-party logistics providers (3PLs), freight forwarders, port operators, customs authorities, and shipping lines. The complexity increases when vehicles are shipped to multiple countries with varying regulatory and compliance requirements. Delays at any point in the supply chain—whether due to port inefficiencies, labor shortages, or documentation issues—can result in significant financial losses and damaged brand reputation.

Moreover, the cost sensitivity of automotive exports makes it imperative to maintain lean logistics operations. Freight optimization, minimal vehicle damage, faster turnaround times, and precise demand forecasting are crucial. As per industry reports, logistics can account for up to 12–18% of the total export cost for an Indian automobile manufacturer (ICRA, 2023). Therefore, reducing inefficiencies in export logistics is a critical strategic goal for industry players.

Recent years have also seen the gradual adoption of digital logistics platforms, GPS-enabled tracking, and blockchain-based documentation systems. These technologies aim to improve visibility, reduce processing time, and eliminate redundancies. Government initiatives such as the National Logistics Policy (2022) and the Port Community System (PCS 1x) are steps toward streamlining the process through digitisation and inter-agency coordination.

In summary, automotive export logistics is a dynamic and integral function of the global supply chain that demands precise coordination, resilient infrastructure, and strategic foresight. As India's automotive export ambitions grow, strengthening the logistical backbone will be a key enabler for sustained international success.

3.2.1 Key components of logistics chain

The automotive export logistics chain includes several interlinked elements. Raw materials and parts move from suppliers to assembly plants (often by rail or road). Finished vehicles are then transported (often on special car-carrier trucks) to pre-shipment yards or directly to ports. At ports, specialized handling equipment (e.g. car trailers, side-loader cranes, roll-on/roll-off ramps) load vehicles into Ro-Ro (roll-on/roll-off) vessels or cargo containers. Sea freight carriers (liner or Ro-Ro services) deliver vehicles to overseas ports, where import clearance and inland distribution follow. Throughout this chain, third-party logistics providers, freight forwarders, and customs brokers coordinate inventory control, documentation, and transportation planning. One critical insight is that coordination among stakeholders (manufacturers, carriers, port authorities, customs) must be tight; any disruption at one node can ripple through the chain. For instance, insufficient parts supply can stop a production line, while a congested port can create a backlog of finished vehicles awaiting shipment. In practice, Indian OEMs often outsource port handling and ocean freight to specialized operators, given the scale of volume.

3.2.2 Role of Port and Shipping

Ports are the linchpin of export logistics. Car export hubs include Mumbai/JNPT, Mundra, Chennai, Kamarajar (Ennore), Kolkata/Paradip, and Vizag. These ports offer

RoRo terminals (where cars are driven on/off ships) and container terminals for boxed shipments. Ports provide pre-shipment storage yards (to hold thousands of new cars), vehicle inspection and export clearance facilities, and loading equipment. For example, Adani Ports' Mundra has a dedicated RoRo berth and parking yard for ~20,000 cars. Chennai Port (CCTPL/CITPL) historically served Hyundai's exports (Hyundai ships ~200k cars/year from Chennai); however, urban congestion pushed many automakers to the newer Kamarajar Port, which in FY2015 overtook Chennai with 2.15 lakh cars shipped (vs 1.93 lakh at Chennai). The image below shows car carrier vessels (e.g. Glovis, NYK) at a port; similar vessels regularly call Indian ports to load export vehicles.

Ports also connect to shipping: ocean carriers provide scheduled RoRo routes to key markets (Europe, Africa, ASEAN, Gulf). Indian exporters use both RoRo services (drive-on/off) and container shipping (cars stowed in containers for high-value models). Port efficiency heavily affects export speed: for example, persistent congestion at Mumbai/ Nhava Sheva has prompted a $525M highway upgrade to cut truck delays. Overall, ports and shipping services form a critical link, so investment in port capacity and connectivity (road/rail links) is actively pursued by government and private operators.

3.3 Identification of operational bottlenecks

Despite growing volumes, India's car export logistics face several bottlenecks. Industry sources note that "the lack of efficient logistics and infrastructure, coupled with bureaucratic red tape, often results in delays and increased costs". Road congestion, limited highway access to ports, port yard shortages, and complex documentation can slow down shipments.

3.3.1 Transportation delays

Delays in land transport are a frequent bottleneck. India's road network, while improving, still suffers from congestion and incomplete links. According to a government report (March 2023), of 749 major highway projects, 402 were behind schedule, illustrating chronic infrastructure delays. Poor connectivity to ports (e.g. narrow or tolled highways) can slow vehicle carriers. Inadequate road connectivity "can result in traffic congestion and

delays" at port gates. Similarly, rail freight, though growing, lacks penetration in some regions. When trucks queue for hours or days at ports (or traffic jams arise en route), exports are delayed and costs (demurrage, detention) climb. A study notes that inefficiencies in India's transport sector – from infrastructure bottlenecks to bureaucratic checks – "often result in delays and increased costs".

Other causes include labor strikes or toll point congestion en route to factories or seaports. For instance, many OEM plants rely on long-haul trucks with limited driver availability, and any disruption (e.g. weather closures) can cascade into major hold-ups. In some cases, dual regulation (state and national permits) complicates transit across state borders. The overall effect is that door-to-door transit times in India are often longer than in developed countries, which becomes a bottleneck for just-in-time export commitments. Addressing this, government initiatives like PM Gati Shakti and the National Logistics Policy aim to upgrade roads and tracking systems to cut transit delays.

3.3.2 Port congestion

Port congestion has become a severe issue in recent years. For example, by mid-2024 Mundra Port (India's largest container gateway) was "hugely congested," with quay operations hampered and container movements slowed. Kuehne+Nagel reported that Mundra was "heavily congested," forcing some carriers to skip calls; rail freight turn-times to/from Mundra jumped from roughly 7–9 days to 15–20 days. At Nhava Sheva (Mumbai), monsoon rains and berth construction have caused waiting times of 18–20 hours for car carriers. In September 2024 heavy rains and flooding paralysed Mundra for days, creating a backlog that took over a week to clear. Such port backlogs dramatically extend export lead times.

Increased global trade has also strained port capacity. New vehicle export volumes have grown faster than berth expansions, leading to yard congestion. For instance, Kuehne+Nagel noted that Ennore Port (Chennai region) and Kolkata had stopped accepting new bookings due to backlog. When terminals become full, ships must wait at anchor or divert to secondary ports, delaying exports further. Carriers have responded by imposing surcharges on Indian exports to offset these inefficiencies. In sum, limited berth capacity,

equipment shortages, and extreme events (weather) all contribute to port congestion, a critical bottleneck for automotive exports.

Documentation and Compliance

Exporting goods from India involves navigating a complex web of documentation and compliance procedures, which act as significant bottlenecks impacting efficiency and timelines. Shipments generally require extensive paperwork, including commercial invoices, packing lists, export licenses, insurance documents, and proof of origin (with recent changes like CAROTAR 2025 adding detail compared to older Certificate of Origin requirements). Overlapping regulations from various bodies like Customs, Export Promotion Councils, and specific sectoral authorities (e.g., plant export procedures) further complicate compliance.

This challenge is particularly pronounced in sectors like automotive exports. Beyond the standard documents, automotive shipments need accurate Shipping Bills, vehicle registrations, and crucial emission compliance certificates. Any error or omission in this paperwork can lead to customs clearance delays lasting days. Furthermore, accessing export incentives such as RoDTEP or TIES necessitates additional filings, adding to the administrative burden.

Bureaucratic red tape, delays in securing necessary government approvals (like EPC certifications), and lengthy export inspection processes (especially for new or low-volume models, or exports to highly regulated markets) introduce uncertainty and costs. Even with the rollout of digital platforms like ICEGATE, Port Community Systems, and e-Shipping Bills, adoption can be uneven, and fragmentation among agencies persists. Procedural inefficiencies at ports, such as manual gate passes and paper-based customs interactions, extend dwell times.

Ultimately, these documentation and compliance hurdles – from complex regulations and certification mismatches to simple paperwork errors – frequently lead to delays, increased costs (including storage fees for idle vehicles), schedule slips, and represent a recurring pain point for exporters, especially when dealing with varying

standards across multiple destinations. Streamlining these processes remains critical for improving India's export competitiveness.

3.4 Challenges in handling and storage

Once vehicles reach a port or transshipment hub, handling and storage pose their own challenges. Cranes and forklifts at terminals are less relevant for cars (since RoRo is mainly drive-on); however, yards require careful organisation.

3.4.1 Risk of Damage

Vehicles and parts are vulnerable to damage at multiple points. Rough handling during loading/unloading – for example, operators moving cars from yard to ship – risks scratches, dents or mechanical stress. India’s export yards often require vehicles to be driven several kilometers from storage lots to berths, increasing exposure to road debris or collisions. Monsoon weather can exacerbate damage: vehicles piled in open yards may suffer water ingress or rust. Even in transit, long truck journeys over uneven roads introduce wear. Industry reports note that damage claims (for scratches or broken components) are a recurring expense in export logistics.

Mitigating damage risk requires strict protocols and training. However, workforce and equipment constraints can make consistent care difficult. Inadequately trained labor or under-maintained forklifts can inadvertently harm cargo. Lack of specialized carriers (e.g. limited availability of 10-car trailers) sometimes forces inefficient multi-stage transfers, each transfer raising risk. Theft and vandalism during long hold at ports are also concerns. As one logistics executive observed, any extended dwell time “increases the risk of damage”. (While formal studies on damage rates are scarce, these concerns are widely acknowledged by freight forwarders.) In short, the physical nature of automotive cargo – large size, delicate finish – means handling/storage must be top-grade, and failures can directly translate to warranty costs or lost reputation.

3.4.2 Inventory Management

Effective inventory control is critical yet challenging in automotive exports. OEMs must balance production of export vehicles against demand in target markets. Excess production leads to holding costs in yards, while shortages mean missed sales. Components supply is similarly sensitive: long lead times on imported chips or parts can halt production, while over-ordering inflates costs. Just-in-time (JIT) production can reduce inventory, but logistics delays then risk plant shutdowns.

In export logistics, finished vehicles often spend time in inland storage awaiting shipment. Managing this inventory requires coordination with manufacturing schedules and shipping slots. Seasonal or model-year changes amplify complexity (e.g. clearing old model stock before shipping). High-value parts (like semiconductors or battery packs) require controlled storage conditions, but Indian warehouses often lack climate control or security for such items.

Technological solutions are being adopted: real-time inventory tracking systems, vendor-managed inventory (VMI) for spare parts, and demand forecasting models. However, fragmented data between suppliers, plants, and warehouses hinders visibility. Many exporters still rely on manual stock counts and aging ERP systems. In sum, inventory management in export logistics must juggle global demand variation with just-in-time efficiency – a tough balance under Indian infrastructure constraints.

3.4.3 Capacity constraints

Space is often at a premium. Most ports have finite capacity for RoRo operations and parking. Chennai's main terminals each have space for only a few thousand cars, and beyond that, vehicles spill into adjacent lots. Kamarajar Port, by design, offered "clean" open parking away from the city, giving it an edge – in FY2015 it handled 2.15 lakh cars thanks to its larger yard and easier truck access. In contrast, crowded urban ports face bottlenecks. Seasonal peaks or delays (like those from Covid backlogs or geopolitical disruptions) can quickly overwhelm capacity. This forces some exporters to reroute vehicles to alternate ports (e.g. Rajkot/Ranoli ICDs or even Pipavav) adding cost. While

new port projects (e.g. Navi Mumbai, Krishnapatnam expansion) promise more space, currently “capacity gaps” in storage and loading berths remain a constraint on scaling exports.

3.5 Technological and Process optimization Strategies

To overcome these challenges, Indian automakers and logistics providers are increasingly adopting technology and lean processes.

3.5.1 Advanced Tracking System

Real-time tracking of shipments enhances visibility. Modern logistic fleets use GPS telematics on trucks and railcars, allowing OEMs to monitor a car’s journey end-to-end. Leading automakers like Maruti Suzuki have implemented digital “consignment tracking” systems (e.g. Trimble’s Visual Cargo), which give dashboards of vehicle locations and ETAs. This reduces “black hole” uncertainty; managers can quickly respond if a carrier is delayed or a misrouting occurs. RFID tags on cars at plants (attached under chassis) are also used by some for-yard checks. Ports are moving to online gate logs. However, tracking penetration is still patchy: smaller exporters often rely on phone calls from drivers. As one report notes, better IoT and cellular-connected devices can further boost chain visibility. Future goals include blockchain-based bill-of-lading and digital platforms that integrate ship schedules, rail slots and customs status, reducing paperwork and manual updates.

3.5.2 Lean Logistics Process

“Lean logistics” – eliminating waste in the flow – is another strategy. This involves synchronizing production schedules with shipment plans (reducing idle storage), just-in-time dispatch to ports (minimizing wait time), and standardizing packing/loading methods. Maruti Suzuki’s ramp-up of rail shipments is a lean move: shifting from 5% of vehicles by rail in 2014–15 to over 21% by 2023–24 has reduced fuel use, emissions and handling steps. Similarly, using direct factory-to-port trains cuts road trips and intermediate touchpoints. Other lean tactics include cross-docking at ports (loading incoming exports directly onto vessels with minimal dwell) and dedicated lines for popular models. For instance, marshalling yards designate lanes by destination market to avoid mix-ups. At the

process level, exporters collaborate with port terminals to reserve berths in advance and use port community systems for faster customs/doc clearance. Such optimizations have improved throughput: Maruti's rail initiative alone "not only benefits the automotive industry but also contributes to sustainable logistics practices"

3.6 Best practices in Industry

3.6.1 Case Study of successful logistics operator

A notable success story is Maruti Suzuki's in-plant railway siding in Gujarat. In March 2024, Maruti inaugurated India's first automobile plant dedicated rail link. Prior to this, finished cars were trucked 100–150 km to port or railheads. The new siding directly connects Maruti's Hansalpur plant to the national rail network. As a result, the company will raise its use of rail for finished cars from 26% to 40%, eliminating roughly 50,000 truck trips per year. This shift saves an estimated 35 million liters of diesel fuel and cuts 1,650 tonnes of CO_2 emissions annually. Operationally, this siding can dispatch up to 300,000 cars per year by rail; Maruti has already shipped over 1.8 million cars via rail to date. By integrating production and logistics on-site, Maruti reduces reliance on road capacity and avoids highway congestion bottlenecks. This also streamlines export loading: completed cars can roll onto freight rakes with minimal handling. Importantly, the project was a public–private partnership under India's PM Gati Shakti program, illustrating how government support enabled a logistics innovation. This case demonstrates best practices: multi-modal integration (rail + truck), private investment in logistics infrastructure, and environmental cost-savings. Other examples globally include OEMs building port-side assembly (e.g. Kniesel-Ro/Ro terminals in Europe), or automakers chartering dedicated Ro-Ro fleets for certainty of service. In India's context, Maruti's rail siding is widely cited as a benchmark for reducing bottlenecks and emissions simultaneously.

3.6.2 Comparative analysis of two best practices

Two contrasting but high-performing logistics strategies are (a) Just-in-Time (JIT) Pull Logistics and (b) Forecast-Driven (Hybrid Push-Pull) Logistics. Both aim to streamline the supply chain, but they differ in inventory strategy and flexibility. The table below summarizes their characteristics in the Indian automotive export context:

Table3.1 Comparison of logistics strategies

Aspect	**JIT Pull Logistics**	**Forecast-Driven (Push/Pull) Logistics**
Inventory Level	Minimal – vehicles and parts flow strictly in response to actual demand and shipping schedules. Stock kept low to cut holding costs.	Higher – maintains safety stock both at plants and ports to buffer against demand variability. Uses demand forecasts to trigger shipments.
Production Scheduling	Synchronized tightly with shipping slots. Line release based on up-to-date export orders. Any delay can halt the line.	Production planned on monthly/ weekly forecasts; ships built in batches. Less sensitive to momentary delays but may build excess.
Responsiveness to Variability	Quick response to real-time demand changes; highly flexible but vulnerable if shipments are delayed or canceled.	More resilient to delays (has buffer) but less agile when actual demand deviates strongly from forecast.
Complexity	Requires robust supplier integration and flawless coordination. Gaps in supply or transport directly stall exports.	Simpler for suppliers (can plan runs), but risk of overstock or under-utilized shipping. Tends to use existing processes.

Implementation in India	Difficult – as of 2024, ~75% of OEMs use some JIT internally, but none fully across the end-to-end supply chain. Infrastructure and coordination gaps limit true JIT.	More common – industry often uses a hybrid pull system: e.g., weekly shipments based on forecasts, with daily trucking to plants as needed. This partly mitigates infrastructure volatility.
Cost and Risk Profile	Lower storage cost, but higher risk of stockouts and disruption costs. Efficiency gains if perfectly executed.	Higher inventory carrying cost, but lower risk of stockouts. Can absorb shocks better (e.g. port delays) at expense of some waste.

(Source: https://worktrek.com/blog/push-vs-pull-through-inventory-management/)

This comparison draws on industry observations. In practice, pure JIT (no inventories) is rare in India's automotive sector, because uneven transit times and unpredictable port delays make it risky. A forecast-driven hybrid (push-pull) approach is often the "safer" choice: shipments are scheduled weekly based on demand projections, with daily supply runs for part buffers. The hybrid model reduces the chance of line stoppages, but it means vehicles or parts may sit idle longer if forecasts overshoot. The relative merits depend on context. For a stable product and reliable shipping (e.g. a high-demand scooter model), JIT can significantly cut costs. For newer or export models with uncertain demand patterns, maintaining extra buffer is prudent. Importantly, many best-practice exporters combine elements of both: they use lean pull for the "last mile" to the port, but keep strategic stockpiles for critical components. Thus, as Table 2 illustrates, neither approach is universally superior; the optimal mix is shaped by market volatility, lead times, and risk tolerance.

3.7 Future Trends and Innovation

The future of car export logistics in India will be shaped by technology and data. Two key areas are notable:

3.7.1 Emerging technologies

Autonomous Systems: Driverless trucks and automated port cranes are on the horizon. Globally, companies are testing self-driving trucks for long-haul routes and autonomous forklifts in yards. In India, as V2X (vehicle-to-everything) and 5G networks mature, we can expect pilot programs linking trucks to traffic management systems. Drones and Robotics: UAVs may support last-mile deliveries of spare parts to far-flung dealers, or survey congestion patterns around ports. Warehouse robots are increasingly common in global auto component warehouses; India is starting to deploy such systems for palletizing.

Digital Twins and Simulation: Industry 4.0 brings the concept of a "digital twin" of the supply chain – a virtual replica of the logistics network. By continuously feeding IoT data into a digital twin, planners can run simulations (e.g. port crush scenarios or route disruptions) and optimize layouts or schedules in real time.

Blockchain and AI: Distributed ledger technology can enhance traceability and trust. For instance, blockchain-backed certificates could guarantee a car's provenance and regulatory compliance across borders, simplifying audits. Meanwhile, generative AI is poised to transform logistics: KPMG notes ~94% of auto supply-chain leaders are considering GenAI tools. AI can autonomously plan shipments, negotiate freight rates, or even generate robust delivery scenarios by analyzing vast data. Early use cases include AI chatbots to handle customs queries or machine-learning-driven demand sensing.

Energy Technologies: The push to decarbonize logistics is driving innovations. Electric trucks (including emerging heavy-duty EVs and fuel-cell vehicles) will gradually replace diesel fleets. Some Indian startups are already trialing electric trucks for intra-city automotive movement. LNG and hydrogen are also seen as transitional fuels for longer-haul carriers, bridging the gap before full EVs. In ports, automated solar or wind energy may power handling equipment. The embedded image above illustrates the connected,

technology-driven logistics of the future: digital data flows (IoT signals, cloud platforms) guiding net-zero carriers (EVs, LNG ships). These trends are not futuristic fantasy but tangible strategies: many Indian OEMs and C&F agents are actively investing in IoT sensors, AI-based route planners, and even blockchain pilots. Such innovations promise to make the export chain smarter and more resilient.

3.7.2 Predictive analysis and Ai

Predictive analytics will be a game-changer in export logistics. By leveraging big data and machine learning, companies can forecast demand, optimize inventory, and preempt disruptions. For example, AI-driven demand forecasting can use market and economic indicators to fine-tune production schedules, reducing the bullwhip effect. In logistics, predictive algorithms can optimize route planning by anticipating congestion or predict equipment failures to schedule maintenance proactively. In India, the AI-in-logistics market is booming: it is projected to grow from ~$0.76B in 2024 to $6.8B by 2032. Companies already use AI for tasks such as freight rate prediction and dynamic routing. A recent example is an AI-powered “RTO Predictor” (return-to-origin) used by e-commerce logistics in India to reduce costly returns. In automotive export, similar predictive tools can score the risk of export delays given weather forecasts or port schedules, allowing firms to reroute shipments or adjust stock levels ahead of time. Another emerging tool is prescriptive analytics: having predicted a delay, the system can suggest actionable remedies (e.g. hold product in intermediate warehouse, charter an alternative vessel, or expedite a custom clearance). IoT sensor data (from trucks and containers) feed into machine-learning models for continual improvement of such predictions. Generative AI offers further possibilities: imagine a digital “logistics assistant” that instantly creates shipping plans or drafts compliance documents based on natural language prompts.

3.8 Summary

Efficient automotive export logistics in India is critical to realizing the country’s potential as a global auto hub. This chapter has detailed the logistics chain and highlighted key obstacles. India has achieved impressive export volumes (over 5 million vehicle-equivalents recently), but challenges remain: transportation delays, port congestion, and

regulatory red tape all add time and cost. Handling of cargo poses risks, and limited warehousing/transport capacity exacerbates bottlenecks. However, the industry is actively addressing these issues. Technological interventions – from real-time tracking (GPS/IoT) to digital customs platforms – are improving visibility and throughput. Lean principles are streamlining processes. Government initiatives and private investments (such as new rail sidings and road upgrades) target infrastructure gaps. Best-practice examples like Maruti's rail link show how integrated solutions can cut costs and emissions. Looking forward, innovation will continue to reshape the landscape. Emerging technologies (AI, blockchain, autonomous vehicles) and predictive analytics promise to anticipate and mitigate delays before they occur. For India's automotive exporters, embracing these trends – while also steadily improving infrastructure – will be essential. If the sector can streamline its supply chain as planned, it stands to boost export competitiveness significantly, capturing more of the global market. The evidence suggests that, although formidable, India's logistics challenges can be overcome through a combination of technology, process excellence, and policy support.

CHAPTER IV
ANALYSIS OF OPERATIONAL BOTTLENECKS IN AUTOMOTIVE EXPORT LOGISTICS

This chapter presents empirical insights derived from survey data collected from freight forwarders across key Indian ports. It analyzes critical bottlenecks such as inadequate port infrastructure, container shortages, complex customs procedures, and fragmented coordination among stakeholders. Case studies are used to contextualize the findings, highlighting recurring issues and providing evidence-based validation of the operational challenges outlined earlier.

4.1 Overview of the data collection methodology model

The data required for this study was collected from 30 freight forwarders actively engaged in the automotive export supply chain across India. The freight forwarding companies selected for this research have practical experience handling exports through key ports such as Mundra, Nhava Sheva, Chennai, and Kamarajar, and their insights help identify and validate operational bottlenecks.

The data collection tool used was a structured questionnaire consisting of both closed-ended and Likert scale questions. This questionnaire was designed to evaluate key aspects of export logistics such as infrastructure adequacy, transportation delays, documentation complexity, and port handling challenges.

4.2 Analysis of operational bottlenecks

4.2.1 Transportation Delays (Road and Rail)

Transportation delays remain one of the most pervasive operational bottlenecks affecting the efficiency of automotive exports in India. These delays occur in the crucial movement phase between the OEM manufacturing units and the port of loading. While road transport is the dominant mode for vehicle movement, due to flexibility and availability, it is also the most vulnerable to external disruptions. Rail logistics, although

considered efficient in theory, is underutilized due to limited infrastructure, rake availability, and operational constraints.

Inland Road Transport Challenges

Across major automotive clusters such as Chennai, Pune, Gurugram, and Sanand, road transportation remains the primary mode of cargo movement to export ports. However, the efficiency of road movement is consistently hampered by:

- Highway congestion: National highways and state roads leading to major ports are heavily congested, particularly near urban and industrial zones. NH-48, which connects Pune to Mumbai and further to Nhava Sheva port, frequently experiences vehicle pile-ups during peak shipping cycles.

- Toll booth delays and entry restrictions: In many states, restrictions on heavy vehicle movement during certain hours lead to unexpected halts. Additionally, poorly managed toll booths and narrow roadways create backlogs, especially near port cities.

- Seasonal disruptions: The monsoon season remains a critical concern. Waterlogging, potholes, and landslides in certain regions (e.g., Konkan belt) delay shipments by several hours or even days. Trucks queued outside Chennai and Ennore ports during the 2023 monsoon faced delays of up to 36 hours due to flooding.

- Urban infrastructure mismatch: While OEM plants are located in planned industrial zones, the access roads leading to ports often pass through dense urban areas with inadequate parking bays, signage, or traffic segregation. As a result, delivery schedules are frequently missed.

Rail Transport Limitations

Despite being promoted under various logistics policy frameworks, rail continues to play a marginal role in automotive exports. A few dedicated automobile rail rakes operate under the Automobile Freight Train Operator (AFTO) scheme, but their availability is limited and not aligned with short lead-time demands. The challenges include:

- Lack of siding connectivity: Most OEMs do not have direct rail connectivity to their factories. This necessitates first-mile truck transport to the nearest terminal, increasing complexity and costs.

- Scheduling rigidity: Unlike trucks that offer flexible dispatch options, rail cargo needs to be booked and planned in advance. This does not match the dynamic production and dispatch schedules of automotive manufacturers.

- Operational preference for passenger traffic: In certain corridors, freight trains are delayed to give priority to passenger trains. This leads to missed vessel connections, especially when the schedule is tight.

4.2.2 Port Infrastructure and Operations

Ports form the final critical point in the automotive export logistics chain. Once vehicles or components arrive at the port, they are prepared for loading onto container vessels or specialized roll-on/roll-off (Ro-Ro) carriers. However, across India's major export gateways, port infrastructure and operations continue to pose bottlenecks that delay and disrupt scheduled movements.

Berth and Yard Capacity Limitations

One of the most reported challenges by freight forwarders is the inadequate yard space and limited berthing availability at Ro-Ro terminals. For instance, Chennai Port and Kamarajar (Ennore) Port handle a significant share of vehicle exports from southern India. While they are equipped with Ro-Ro terminals, congestion during peak dispatch cycles is common.

- At Chennai Port, the main Ro-Ro terminal often reaches full capacity during month-end exports, when OEMs schedule bulk dispatches to meet overseas contractual timelines.

- Mundra Port, while more modern, often faces berthing delays during seasonal surges when vessels queue up due to overlapping sailing schedules.

- In some cases, automotive cargo meant for Ro-Ro loading is temporarily held in general cargo yards due to space unavailability, exposing it to damage risks and increasing transfer costs.

Ro-Ro Vessel Scheduling Challenges

Ro-Ro vessels — which are critical for finished vehicle exports — operate on tight international schedules. However, freight forwarders report that limited vessel frequency and last-minute rescheduling are common. These issues arise from:

- Unpredictable berthing conditions caused by weather or port maintenance.
- Delays in prior port calls on the vessel's route, pushing back its arrival at Indian terminals.
- Prioritization of bulk cargo or container vessels during port congestion.

In 2024, forwarders at Chennai Port reported that two consecutive Ro-Ro vessels were delayed by over 24 hours due to yard congestion, resulting in missed loading opportunities for at least 150 vehicles.

Operational Delays at the Port Interface

In addition to infrastructure constraints, inefficiencies in cargo handling operations also contribute to shipment delays:

- Manual cargo registration and vehicle inspection processes still prevail at some terminals, adding 4–6 hours of lead time per batch.
- Limited availability of dockside equipment, such as drive-on ramps, forklifts, and handlers, forces logistics providers to wait for previous shipments to be cleared before cargo can be moved to the vessel deck.
- Mismatch in port gate timings and vessel schedules means vehicles often arrive but are not loaded due to timing conflicts.

These inconsistencies are particularly harmful for Ro-Ro shipments, where vehicle sequencing and rapid loading are crucial.

Document Clearance Bottlenecks at Ports

Even after the physical arrival of the cargo at the port, shipments may not be cleared for loading due to pending documentation. Customs processing, vessel booking confirmation, and terminal approval often run on parallel but disconnected systems, leading to:

- Cargo being staged near the loading area without movement for hours or days.
- Demurrage charges levied due to port storage rule violations.
- Unexpected reallocation of yard slots, creating further repositioning work.

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4.2.3 Container Shortages

In the automotive export logistics system, the use of containers is generally limited to very specific scenarios. For finished car exports, the predominant method of movement is through roll-on/roll-off (Ro-Ro) vessels or drive-in drive-out berths at designated terminals. However, container shortages still present a bottleneck in specific cases where finished vehicles must be containerized due to:

- Unavailability of Ro-Ro services on certain routes
- Export orders for smaller volumes to specific countries
- Special requests from overseas buyers for containerized shipping due to port limitations or inland distribution needs

In such scenarios, the ability to secure clean, dry, undamaged 40-foot containers becomes critical. Exporters must ensure vehicles are packed safely within the container without damaging external body parts or electronics, especially in long-haul sea transport.

Limited Availability of Vehicle-Grade Containers

The shortage arises not just from volume mismatch, but from limited availability of containers suitable for finished vehicles. Containers must meet the following conditions:

- Interior free from rust, oil, or prior chemical cargo
- Adequate headroom and tie-down points
- Clean, dry, and ventilated to avoid moisture accumulation

Unfortunately, most general-use containers circulating in the Indian export system do not meet these standards. As a result, freight forwarders struggle to obtain appropriate boxes for containerized vehicle movements.

Scheduling Disruptions Due to Non-Availability

When a shipment plan involves containerized vehicles — usually for long-distance or low-volume orders — unavailability of compliant containers can derail the entire schedule. Unlike Ro-Ro loading, which offers flexibility in timing and sequencing, containerized loading is heavily dependent on:

- Pre-stuffing at inland depots
- Trucking of full containers to port
- Slot booking with shipping lines

If suitable containers are not delivered to the plant or depot on time, the vehicles must be held back, often incurring holding costs and storage congestion at the origin.

Geographical Impact on Container Allocation

At ports like Mundra or Nhava Sheva, where container movement is high due to general cargo and import-heavy balance, exporters have better access to container pools. However, at ports like Chennai or Kamarajar, which rely more on Ro-Ro movements, container logistics infrastructure is limited. Exporters planning container-based movement from these ports face added challenges in sourcing equipment from distant container freight stations (CFS) or shipping line allocations.

Consequences for Finished Car Exporters

The impact of container shortage on finished car exports includes:

- Delay in vehicle dispatch, especially for clients requiring shipment in specific units or special packaging
- Increased cost of repositioning containers from surplus ports or CFS yards
- Risk of shipment cancellation if vehicles cannot be delivered within the buyer's planned clearance window
- Last-minute adjustments to change routing from container to Ro-Ro or vice versa, depending on availability

Even though most mass exports continue via Ro-Ro, the inability to meet containerized shipment requests in niche markets reduces flexibility and customer satisfaction for Indian vehicle exporters.

4.2.4 Documentation and Customs Procedures

In the automotive export process, documentation and customs procedures are critical stages that directly affect the timing and reliability of shipment dispatch. While the government of India has invested in port digitization and single-window customs clearance systems, exporters continue to face frequent delays and inconsistencies in this area. These delays are particularly sensitive in the case of finished car exports, where bulk shipments rely on tightly scheduled vessel movements.

Volume and Complexity of Documentation

The shipment of fully built vehicles for export involves a range of essential documents, including:

- Shipping bills and commercial invoices
- Vehicle inspection reports
- Vehicle identification numbers (VIN) listings
- Certificate of origin
- Port trust forms and port gate passes
- Packing lists and exporter declarations
- Customs self-assessment forms and e-Sanchit uploads

Even though many of these documents are now filed electronically, exporters frequently encounter system delays, verification queues, or manual intervention requirements that prolong the clearance process

Mismatch in Documentation vs Physical Cargo

One of the recurring bottlenecks reported by freight forwarders is the discrepancy between the physical cargo (i.e., number of vehicles delivered at the port) and the listed units in the documentation. For instance:

- VINs may be entered incorrectly or missed during batch uploads.
- Inspection certificates from the OEM may not match the declared export model variant.
- Last-minute changes in the export lot (such as unit replacement due to QC hold) are not always reflected in documentation, leading to customs flagging.

Such mismatches result in customs clearance delays and force re-validation, which affects the gate-in timing and vessel connection.

System and Connectivity Issues

The customs filing systems — such as ICEGATE, e-Sanchit, and port community systems have improved the speed of document submission, but they still experience:

- System downtimes or slow server responses during peak hours
- Unclear response codes or rejection notices without specific instructions
- File format mismatches when exporting high volumes of VIN data or supporting attachments

In such cases, exporters are forced to re-upload or manually intervene through customs facilitation centers, adding 8–12 hours or more to the clearance window.

4.2.5 Coordination and Supply Chain Fragmentation

Fragmentation across supply chain actors — including OEMs, freight forwarders, port operators, and customs — creates significant operational inefficiencies. Roughly 40% of surveyed logistics professionals agreed that coordination problems among these stakeholders led to frequent delays.

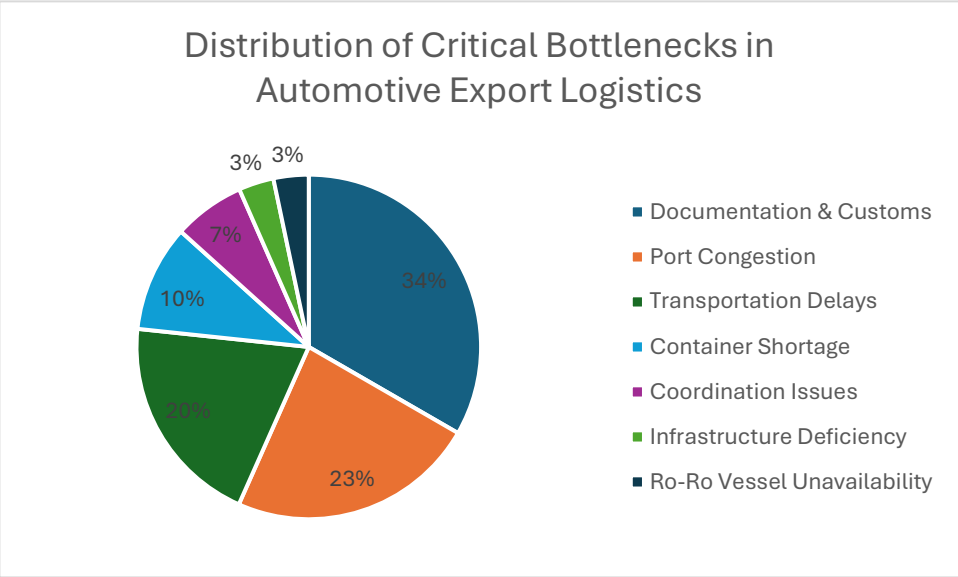
Misalignment between factory dispatch and port booking windows often results in finished vehicles being stored at interim locations, increasing handling risks. Freight forwarders highlighted issues such as last-minute vessel schedule changes not being communicated promptly, leading to missed connections or stranded cargo.

Additionally, different actors use disparate digital systems, limiting visibility across the chain. A common example is inadequate synchronization between port cut-off times and factory dispatch schedules, which can cause cascading failures downstream.

While some large OEMs have implemented centralized logistics platforms, only 30% of forwarders reported having access to full end-to-end cargo tracking.

In an industry where just-in-time shipping is critical, even a small delay or miscommunication can escalate into major cost overruns or contractual penalties. Thus, coordination gaps represent a serious structural barrier to achieving seamless exports.

Figure 4.1: Distribution of Critical Bottlenecks in Automotive Export Logistics



(Source: Primary Data.)

4.3 Identification of Key challenges

From transportation delays and port congestion to container shortages and documentation hurdles, it is evident that these challenges are deeply embedded within the structure of the logistics ecosystem. In this section, the objective is to summarize and classify these bottlenecks to identify the most critical and recurring challenges as perceived by industry participants and confirmed through multiple observations and studies.

4.3.1 Summarizing Observed Bottlenecks

From the analysis, certain challenges have emerged consistently across different stages of the export process:

Delays in Road and Rail Transportation: Issues such as poor road conditions, lack of multimodal facilities, weather-related disruptions, and limited rail access remain persistent. These delays affect the timeliness of cargo arrival at ports and often disrupt shipping schedules.

Port Congestion and Limited Infrastructure: Despite improvements, major ports continue to operate near or beyond capacity. Overlapping cargo schedules, limited Ro-Ro vessel frequency, and poor yard management contribute to extended vessel turnaround times and frequent queuing.

Container Availability and Handling Limitations: Shortages of containers, especially during peak periods, have forced exporters to either delay shipments or resort to costlier alternatives. Inadequate container repositioning and imbalances between import/export container flows also fuel this issue.

Bureaucratic Complexity in Documentation: Exporters consistently face delays due to repetitive paperwork, overlapping approval systems, manual validation, and inconsistent regulatory interpretations at different ports.

Fragmented Coordination Among Stakeholders: There is often a lack of synchronized planning between OEMs, freight forwarders, customs authorities, and shipping lines. Mismatched timelines, duplicated communication, and unshared tracking data create frequent delays.

4.3.2 Stakeholder Perceptions and Industry Sentiment

Freight forwarders and port-side logistics providers report varying experiences across ports, but several themes are consistent:

- Documentation and customs procedures were flagged by over one-third of surveyed forwarders as the single largest time sink. Delays often stem from paperwork mismatches, slow approvals, or procedural ambiguity.

- Port congestion and capacity strain were particularly noted at Chennai Port, where overlapping vehicle shipments often cause loading delays. Forwarders at Mundra reported better berth access but noted sudden scheduling adjustments.

- Inland transport issues, while not always severe, contribute to unpredictability in the timing of vehicle arrivals — especially when vehicles are moving from deep interior locations like Sanand or Bidadi.

- Communication lags among port operators, shipping agents, and customs officers were frequently mentioned as the reason for last-minute clearance delays or failed vessel connections.

4.3.3 Classification of Critical Challenges

Based on their frequency of occurrence and operational impact, the key challenges can be classified as follows:

Table 4.1 Challenges in Export

Area	**Specific Challenges**	**Nature**
Inland Transportation	Delays, congestion, rail access limitations	Infrastructure
Port Operations	Yard congestion, vessel waiting, low Ro-Ro frequency	Operational
Container Management	Shortages, repositioning delays, uneven availability	Supply Chain

Documentation and Compliance	Procedural complexity, system errors, verification lag	Administrative
Stakeholder Coordination	Poor communication, timing mismatches, lack of visibility	Organizational

*(Source: Society of Indian Automobile Manufacturers (SIAM) export statistics*siam.in*.)*

4.3.4 Interconnectedness of Challenges

A key observation is the recurrence of these challenges at different stages of the logistics cycle. For example, a shipment delayed in transit may miss its port gate-in slot, resulting in rescheduling. Similarly, an issue in documentation can delay loading despite cargo being ready at the terminal.

In several instances, these issues are interdependent. One weak link in the chain, whether in transport, documentation, or communication, has the potential to delay the entire export cycle.

4.3.5 Patterns of Challenges

Among the challenges identified, documentation and customs clearance emerged as particularly frequent points of concern. Participants emphasized that these are less predictable and more difficult to buffer for, as delays often occur without any advance indication.

Inland transit delays and port congestion followed closely, noted for their recurring impact on shipment timeliness. Coordination challenges, while sometimes less visible, were frequently mentioned as amplifying other delays through poor synchronization.

Across all reported issues, a recurring theme is the close interaction between infrastructure, process, and communication. The export process functions as a tightly sequenced chain; any misalignment, whether at the physical or procedural level, contributes to overall inefficiency.

4.4 Case study

4.4.1 Case 1 – Port Yard Congestion at Chennai Port

A leading OEM based in Tamil Nadu planned to export 120 finished passenger cars to West Africa via Ro-Ro shipment through Chennai Port. The vehicles were dispatched in three separate trailer convoys over a two-day window.

Observed Bottlenecks:

- Port gate congestion: On arrival at the outer gate of Chennai Port, all three trailers experienced delays in entry due to a backlog of other Ro-Ro shipments being staged simultaneously.
- Berth unavailability: Although the Ro-Ro vessel was berthed on time, the loading window for automotive cargo was compressed due to overlapping calls from other export clients.
- Yard overload: With limited space in the Ro-Ro terminal, vehicles were parked in overflow lots and had to be moved again just before loading, causing handling delays.

Outcome:
Out of the 120 units, only 90 were loaded within the allotted time frame. The remaining 30 were held back for the next sailing. The freight forwarder incurred additional yard handling charges and storage fees. The customer in the destination country had to adjust their delivery schedule.

4.4.2 Case 2 – Documentation Delay at Mundra Port

A shipment of 85 fully built vehicles was planned for export to Southeast Asia through Mundra Port. The shipment was containerized due to specific delivery conditions set by the overseas buyer. The vehicles were loaded into containers at an ICD near Ahmedabad and trucked to the port.

Observed Bottlenecks:

- ICEGATE submission delay: Although all customs documents were prepared in advance, the ICEGATE system experienced downtime the night before submission.

- Discrepancy in invoice values: Customs authorities flagged a mismatch in declared FOB value for five units. A correction was needed and resubmission was delayed by over 36 hours.
- Port stowage conflict: Because the containers could not be cleared in time, they missed their original vessel and had to be re-booked for the next sailing.

Outcome:

The shipment was postponed by four days. The forwarder bore rebooking fees, and the container yard charged additional storage. No vehicles were damaged or lost, but the incident disrupted the OEM's planned inventory dispatch for the next export batch.

4.5 Summary of Analysis

This chapter presented an in-depth examination of the various operational bottlenecks affecting the automotive export logistics sector in India. Through a combination of structured data analysis, field-based insights, and case observations, it was possible to highlight the key pressure points that consistently disrupt the flow of outbound shipments.

The study revealed that transportation delays — both on road and rail — continue to present a major obstacle, especially during peak seasons or in cases where multimodal options are not readily available. Despite the development of national highway corridors and dedicated freight infrastructure, several connectivity issues persist near manufacturing hubs and port entry zones.

Port operations remain another prominent challenge. Yard congestion, berth allocation limitations, and infrequent Ro-Ro vessel scheduling contribute to reduced efficiency in cargo handling. These issues are particularly notable at major ports such as Chennai, Nhava Sheva, and Mundra, where overlapping schedules and vessel queuing are frequently reported.

Documentation and customs procedures emerged as one of the most consistently cited concerns. Exporters often face unexpected hold-ups due to discrepancies in

paperwork, changes in procedural requirements, or interpretation differences at customs checkpoints. These procedural delays can be difficult to predict and have a direct impact on shipment timelines.

The shortage of containers, particularly during high-demand periods, continues to affect exporters relying on containerized transport for automotive parts and components. Container flow imbalances between import-heavy and export-heavy ports add to the uncertainty in securing the necessary equipment for scheduled shipments.

In addition to these direct logistical challenges, coordination gaps among various stakeholders in the export chain also contribute to delays. Mismatches in scheduling, limited visibility into cargo readiness, and fragmented communication between OEMs, logistics providers, and authorities lead to inefficiencies that multiply as shipments progress toward dispatch.

The case study further illustrated how these bottlenecks can interact in real-time to affect a single export movement. Delays in transportation, followed by documentation discrepancies and port yard congestion, led to a missed shipping schedule — demonstrating the cumulative effect of these operational challenges.

Overall, this chapter highlighted the major logistical constraints currently faced by freight forwarders and exporters in the automotive sector. Each of the challenges discussed plays a role in shaping the broader experience of cargo movement from origin to port. These findings form the basis for further discussion in the next chapter, where possible strategies and measures to address these operational limitations will be considered.

CHAPTER V

DISCUSSION, RECOMMENDATION AND CONCLUSION

The final chapter synthesizes the key findings of the research, discussing their implications in light of India's automotive export ambitions. It proposes targeted policy recommendations, operational improvements for freight forwarders, and strategic reforms in infrastructure and digital systems. The chapter concludes by reflecting on the broader significance of the study and offering directions for future research to further strengthen India's automotive export logistics framework.

5.1 Discussion

India's automotive export sector, though rapidly expanding, is constrained by a complex web of logistical inefficiencies that significantly hamper its global competitiveness. As observed in the detailed analysis of Chapter 4, operational bottlenecks persist across the entire export logistics chain—from inland transportation and port operations to documentation procedures, equipment availability, and inter-stakeholder coordination. These constraints are not isolated events, but interconnected and recurring challenges that disrupt the rhythm and reliability of finished vehicle exports. This section discusses the systemic nature of these obstacles, elaborates on their implications, and examines how they influence freight forwarders and export operations more broadly.

The first and most visible constraint in India's export chain is transportation delay. Despite substantial investments in national highways and the introduction of the Bharatmala and Gati Shakti infrastructure initiatives, freight vehicles often experience extended transit times. Most automotive manufacturing hubs are located inland—in Pune, Chennai, Gurugram, and Sanand—necessitating long-distance transport to coastal ports. The majority of this movement occurs via road due to the absence of fully functional rail connectivity or time-aligned rakes. Indian freight trucks average 25–30 km/h, which is significantly slower than international norms and results in shipment delays, inconsistent transit windows, and unpredictable scheduling. Freight forwarders are routinely compelled

to build buffer time into their planning to compensate for these inefficiencies, reducing the flexibility and precision that modern just-in-time (JIT) export environments require.

Port congestion adds another layer of operational complexity. India's major automotive ports—Chennai, Mundra, and Kamarajar—frequently operate near or over capacity, especially during peak dispatch periods. This congestion is particularly acute at Ro-Ro terminals where finished vehicle exports are concentrated. Port yards often lack sufficient space to handle the volume surges associated with end-of-month shipments, leading to cargo being queued at outer gates or redirected to temporary staging areas. The consequences are twofold: an increase in port dwell times and higher operational costs for freight handlers, including demurrage and double-handling charges. Vessel berth availability and scheduling changes are also inconsistent, forcing freight forwarders to re-adjust delivery plans at short notice, often without full visibility into the revised timelines.

The documentation process further complicates export logistics. Despite the digitization initiatives through ICEGATE and e-Sanchit, customs clearance remains a time-consuming and error-prone stage. The export of finished vehicles involves a considerable volume of paperwork, including shipping bills, inspection reports, commercial invoices, and VIN declarations. Even minor discrepancies—such as mismatches in invoice figures or HS codes—can trigger verification holds, delaying the clearance of entire consignments. Moreover, customs procedures vary from port to port, with inconsistent interpretation of regulatory rules and manual intervention still prevalent in many locations. These inconsistencies introduce uncertainty and friction into the export process, making it difficult for freight forwarders to predict clearance timelines or confidently commit to delivery schedules.

Container availability, though less central to finished vehicle exports (which primarily use Ro-Ro services), still represents a bottleneck in specific contexts. Certain exports, particularly to smaller ports or markets with no Ro-Ro infrastructure, require containerized shipment of vehicles. The shortage of clean, compliant, and readily available containers suitable for such movements often delays the fulfillment of niche export orders. India remains dependent on global container circulation patterns, and international

disruptions—such as those arising from the COVID-19 pandemic or the Red Sea shipping crisis—have exposed vulnerabilities in this model. Freight forwarders struggle to procure the right equipment at the right time, especially when demand spikes during the pre-shipment phase. Additionally, within the Ro-Ro model itself, the availability of trailers, ramps, and trained handling equipment is often inadequate, particularly at smaller or secondary ports.

Perhaps the most system-wide issue across all of these categories is the lack of real-time coordination among stakeholders. Export logistics involves a chain of interdependent players—OEMs, transporters, forwarders, customs officers, port authorities, and shipping agents—each of whom operates on disparate platforms with limited interoperability. Information sharing is frequently manual, delayed, or incomplete, leading to missed loading windows, double-booked slots, and inefficient port yard management. The lack of an integrated digital platform that offers unified visibility and status updates significantly hampers proactive logistics planning. Freight forwarders, in particular, find themselves burdened with the responsibility of communicating across fragmented systems while bearing the cost of delays and misinformation.

Globally, countries that dominate automotive exports have already addressed many of these challenges through integrated logistics ecosystems. In Germany, for example, seamless integration between rail terminals and port yards, standardized documentation under EU regulations, and automated customs clearances contribute to high efficiency and low dwell times. In Mexico, a major vehicle exporter to the U.S. and Latin America, dedicated Ro-Ro corridors, synchronized transport windows, and real-time tracking systems ensure smooth cross-border operations. Singapore offers a benchmark for digital integration, with its PortNet platform connecting all logistics players and agencies through a centralized information-sharing system.

In contrast, India’s automotive logistics ecosystem is still evolving. Although the National Logistics Policy (NLP) 2022 and the Gati Shakti Master Plan propose integrated planning and multimodal transport systems, these initiatives have not yet translated into uniform on-ground performance. While Mundra Port offers modern infrastructure and

relatively faster clearance processes, public ports like Chennai and Kamarajar continue to face bureaucratic delays, infrastructure limitations, and procedural fragmentation. For freight forwarders operating in this environment, the result is a landscape where planning is reactive rather than predictive, and execution is often shaped by informal negotiations and contingency arrangements.

In summary, the challenges affecting India's automotive export logistics stem from a combination of infrastructural, procedural, and systemic gaps. Transportation delays, port congestion, documentation inefficiencies, equipment shortages, and coordination breakdowns form a recurring pattern that undermines logistics performance. These challenges directly affect the reliability, timeliness, and cost-efficiency of exports, placing Indian manufacturers and their logistics partners at a disadvantage in the global market. The discussion presented here reflects the lived experience of forwarders and logistics professionals, offering a holistic understanding of how operational friction is embedded within the very structure of the current export system. The following sections will outline the policy and operational strategies required to address these bottlenecks and support India's ambition to become a leading global hub for automotive exports.

5.2 Policy Recommendation

In response to the persistent logistical constraints identified in India's automotive export ecosystem, a comprehensive suite of policy interventions is necessary. While India has taken ambitious steps toward logistics reform through the National Logistics Policy (NLP) 2022 and the Gati Shakti Master Plan, the implementation of these frameworks must be deepened and calibrated to reflect the specific needs of time-sensitive sectors like automobile exports. The challenges of transport inefficiencies, port congestion, fragmented coordination, and regulatory inconsistencies demand targeted policy responses that enhance multimodal integration, standardize digital systems, and harmonize institutional protocols.

The first and most critical policy imperative is to accelerate infrastructure development aligned with automotive export corridors. While the NLP sets an overarching objective of reducing India’s logistics costs from 13–14% of GDP to global benchmarks

near 8%, this can only be achieved through focused investment in corridors that matter most to export-oriented sectors. For the automotive industry, this includes enhanced road and rail links connecting manufacturing hubs in Maharashtra, Tamil Nadu, Gujarat, and Haryana to gateway ports such as Mundra, Chennai, and Kamarajar. Projects under Bharatmala Phase II must prioritize expressways that bypass urban chokepoints and reduce journey times for export cargo. Similarly, the Dedicated Freight Corridors (DFC) under Gati Shakti should include specialized rake facilities for automobile freight, complete with loading/unloading platforms and integration with Ro-Ro vessel terminals. The absence of multimodal linkages is a fundamental drag on export reliability. By creating direct rail-to-port connectors and expanding inland container depots near automotive clusters, the government can reduce first- and last-mile delays significantly.

Equally important is the modernization and expansion of port infrastructure with a Ro-Ro export focus. Although some private ports like Mundra have shown operational superiority through advanced scheduling and automated cargo handling, many state-operated ports remain constrained by physical limitations and outdated management systems. Policy must encourage public-private partnerships to redevelop port yards, automate gate-in sequencing, and deploy predictive yard planning tools. This includes the digitization of Ro-Ro yard inventories, the introduction of slot booking applications, and the integration of port terminal systems with inland logistics data. Ports should be incentivized to create dedicated vehicle-handling berths and staging areas during peak export windows, reducing the current dependence on ad-hoc space management.

From a regulatory standpoint, harmonization of customs processes and documentation standards is another pressing area for intervention. Despite the existence of ICEGATE and e-Sanchit platforms, exporters still encounter divergent interpretations of export rules and inconsistent customs processing across ports. The policy solution lies in enforcing a single-window system backed by uniform training, centralized data validation, and pre-clearance models. The National Trade Facilitation Action Plan (NTFAP) 2020–2023 already proposes measures such as risk-based inspections, unified data sharing, and time-bound clearance targets. These must now be institutionalized across all major ports through legislative mandates. Furthermore, the integration of customs systems with the

Unified Logistics Interface Platform (ULIP) under Gati Shakti offers the potential for real-time visibility across transport, inventory, and clearance stages. Policy must ensure full adoption of ULIP across customs offices, shipping lines, and port authorities to eliminate data silos and enable predictive planning.

A parallel requirement is the simplification and standardization of export documentation procedures. Automotive exports often involve complex itemization, including vehicle identification numbers (VINs), compliance certificates, and quality assurance documents. Errors or inconsistencies in any of these can halt a shipment. Policymakers should push for industry-specific templates under India's Digital Export Documentation Framework, allowing exporters and freight forwarders to use pre-validated forms. The introduction of blockchain-based document validation pilots under the Ministry of Commerce should be expanded to auto logistics corridors, enhancing both the speed and integrity of exchanges of documentation.

Another key area of reform lies in container and equipment logistics. While finished vehicles are predominantly shipped via Ro-Ro methods, certain destinations and shipment profiles still rely on containerized transport. India’s dependence on foreign container pools makes it vulnerable to global disruptions. To address this, government policy should support domestic container manufacturing and incentivize container ownership among Indian logistics providers. The Production Linked Incentive (PLI) scheme for steel and fabrication sectors could be extended to cover container and chassis units, reducing the reliance on leased foreign equipment. Additionally, the revival of the Shipping Corporation of India and other public maritime logistics firms should be directed toward establishing a nationally backed container leasing pool for emergency deployments.

Broader institutional coordination is also essential. Presently, logistics decisions are fragmented across multiple ministries and authorities—Commerce, Road Transport, Railways, Ports, and Finance—all of which impact different aspects of automotive exports. The creation of a National Logistics Coordination Council under the NLP was a significant step, but its operational influence remains limited. A stronger cross-ministerial logistics task force should be created specifically for export-centric sectors, beginning with

automobiles, where export value is growing rapidly and timing is critical. Such a task force should include representatives from SIAM, FIEO, ACMA, and leading freight forwarders, and be empowered to identify corridor-level bottlenecks in real time and recommend corrective measures. This body could also work with state governments to resolve local transport and clearance delays, for instance by ensuring 24/7 port access or aligning police inspection protocols across districts.

Furthermore, policy must promote logistics skill development and digital adoption at the operational level. Freight forwarders, especially small and medium operators, often lack the capacity to invest in advanced technology or compliance training. Government schemes such as the PM Gati Shakti Digital Learning Portal and the Logistics Human Resources Development Program should be expanded and tailored to the needs of auto logistics professionals. Subsidies or tax credits for adopting Transport Management Systems (TMS), Warehouse Management Systems (WMS), and customs compliance platforms would encourage forwarders to improve tracking, scheduling, and visibility. These investments will have downstream benefits for manufacturers and exporters, reducing friction across the supply chain.

Lastly, India's trade and logistics policies must remain responsive to external shocks and international benchmarks. The COVID-19 pandemic, Suez Canal blockage, and Red Sea disruptions have exposed vulnerabilities in over-reliance on global shipping corridors and foreign vessel operators. Policy should encourage the development of alternate trade routes, greater use of coastal shipping, and long-term agreements with domestic carriers. As countries like Vietnam and Indonesia increase their share of global automotive exports, India must ensure that its logistics policies remain agile and aligned with global supply chain shifts. Monitoring tools, export performance indices, and real-time dashboards under the NLP should be calibrated to provide sector-specific feedback, enabling rapid response to emerging challenges.

In conclusion, the policy landscape for addressing India’s automotive export logistics challenges must move beyond high-level declarations toward granular, operational reforms. By accelerating corridor-specific infrastructure development,

harmonizing customs and documentation protocols, integrating digital systems, and promoting institutional coordination, the government can meaningfully reduce export cycle times and improve predictability. Such reforms, when aligned with private-sector capabilities and sectoral growth targets, will enable India to strengthen its position in global automotive markets and realize the full potential of its "Make in India" export ambitions.

5.3 Recommendations for Freight Forwarders

Freight forwarders play a pivotal role in translating logistics reforms into ground-level efficiency. To improve operational efficiency, visibility, and coordination, forwarders should consider the following strategies:

- Adopt advanced digital tools and real-time visibility: Forwarders must invest in transportation management systems (TMS) and Internet-of-Things tracking to know shipment locations at all times. Industry reports emphasize that having an end-to-end "bird's eye view" of cargo flows lets operators react swiftly to issues. For example, real-time tracking and alert platforms can immediately flag port delays or customs holds, allowing forwarders to arrange contingency plans. By sharing this data with clients (e.g. via dashboards), forwarders meet shippers' growing demand for transparency and help avoid avoidable costs like demurrage. Integration with government portals (e.g. the Unified Logistics Interface Platform) should also be pursued, so that forwarders can automate filings and retrieve approvals in hours rather than days.
- Optimize transport modalities and routing: Rather than relying solely on trucking, forwarders should develop multimodal strategies. For instance, consolidated rail freight services (national or private railways) could move bulk car parts toward port hinterlands, reducing road congestion. Coastal barge or feeder services (under Sagarmala incentives) can likewise relieve coastal highway chokepoints. Forwarders should negotiate block-space or volume deals with carriers and rail operators to secure capacity in advance. Additionally, using freight-matching platforms and cargo pooling can reduce empty runs: for example, collaborating with other shippers in the same trade lane to share containers and minimize return trips. These efficiency gains directly lower

per-unit costs and mitigate container scarcity risks by making better use of available equipment

- Strengthen coordination with partners: To tackle the "chaos" in India's supply chain, forwarders must proactively coordinate with all stakeholders. This means maintaining close communication with shipping lines (to monitor schedule changes), port authorities (for berth and yard updates), and consignees (for receiving preparedness). Establishing joint forecasting forums with key OEM clients and component suppliers can align production schedules with booking plans. Membership in industry associations (like FIATA or regional freight forwarder councils) can also improve access to shared intelligence and best practices. For example, forwarders might collaborate on risk-sharing mechanisms (such as insurance pools for demurrage costs) or lobby for more predictable port tariffs.
- Enhance regulatory compliance and expertise: Forwarders should deepen their expertise in customs and trade regulations. By investing in trained personnel or compliance software, they can avoid documentation errors that cause clearance delays. Using the Customs Logistics Interface (CLIP) and networking with customs brokers, forwarders can expedite clearances. In addition, they should stay updated on incentives like export subsidies, compliance schemes (authorized economic operator status), and trade agreements to help clients leverage every advantage. Workshops and certification courses (e.g. on FTA usage or export licensing) are valuable investments.
- Build resilience and risk management capacity. Recognizing that not all disruptions can be prevented, forwarders should maintain robust contingency plans. This can include identifying alternate routes and ports (for example, shifting exports from Chennai to Cochin or Tuticorin if congestion occurs) and pre-arranging backup shipments. Stocking critical packaging or consolidation materials near ports and at inland depots can speed processing in an emergency. Forwarders should also encourage clients to buy moderate insurance coverage or use payment guarantees (such as bank letter-of-credit contingencies) to cushion financial impacts when delays cause penalties. By institutionalizing such risk-mitigation measures, freight forwarders can limit the financial burden of operational hiccups.

By focusing on these strategies, freight forwarders can directly counter the bottlenecks identified in this study. Improved visibility and coordination alone can significantly reduce idle time and avoidable fees, while operational efficiency gains (multimodal routing, smarter loading) speed up actual transit. In concert with the government's policy push, these private-sector actions will help unlock swifter and more reliable export logistics for India's automotive industry.

5.4 Conclusion

The logistics chain supporting India's automotive exports stands at a pivotal crossroads—caught between structural legacy constraints and the momentum of policy-driven reform. The discussion presented in this chapter has revealed the depth and persistence of operational bottlenecks that freight forwarders, exporters, and terminal authorities continue to navigate. These challenges are not isolated or circumstantial; rather, they reflect systemic issues that shape the day-to-day realities of international automotive trade from India. Delays in inland transport, inconsistent vessel scheduling, fragmented documentation systems, equipment shortages, and the absence of integrated coordination mechanisms represent the primary hurdles faced by stakeholders involved in outbound logistics. Each of these bottlenecks individually impacts cost, efficiency, and reliability—but in combination, they erode the competitiveness of Indian automotive exports in global markets.

India's response to these challenges, in the form of the National Logistics Policy (NLP) 2022, the Gati Shakti Master Plan, and related sectoral reforms, reflects a growing recognition of logistics as a strategic national capability. These frameworks rightly aim to reduce logistics costs, promote multimodal transport, digitize supply chains, and improve inter-agency coordination. However, the implementation of these policies remains uneven across corridors, ports, and administrative layers. For the automotive sector—where time-sensitive export cycles, precision coordination, and high cargo value are standard—the stakes are particularly high. The success of these policy ambitions will ultimately be judged by their ability to resolve on-ground frictions, not simply by infrastructure spending or reform announcements.

At the heart of this transformation are freight forwarders. As the operational lynchpin of the export supply chain, freight forwarders not only execute movement plans but also bear the risk of delay, miscommunication, and regulatory ambiguity. The recommendations laid out in this chapter emphasize the importance of forwarders adopting a strategic mindset—investing in digital systems, strengthening planning and coordination, embracing multimodal alternatives, and professionalizing compliance. These shifts will not only improve their own operational metrics but also raise the performance baseline for the entire export ecosystem. Forwarders who align their operations with government reforms, anticipate disruptions, and build transparent, tech-enabled workflows will be best positioned to serve India's next generation of automotive exporters.

Looking ahead, India's target of achieving $60 billion in automotive exports by 2030 is ambitious but attainable—provided that logistics capabilities evolve in tandem. This requires a joint effort. Policymakers must accelerate corridor-level investments, enforce uniform customs protocols, and incentivize digitization among stakeholders. Port authorities must transition to predictive, tech-based planning models. Freight forwarders must act as integrators—bringing together disparate processes, timelines, and partners into a coherent whole. And exporters must view logistics not as a cost center, but as a strategic function that influences delivery performance and brand reputation in overseas markets.

This chapter has synthesized the analytical findings of the previous sections into a comprehensive discussion of the automotive export logistics landscape, provided policy-level insights, and offered freight forwarder-specific guidance for performance enhancement. The absence of recommendations in Chapter 4 was intentional—to preserve the objectivity of bottleneck identification. However, in this chapter, solutions have been foregrounded, framed in terms of feasibility, strategic alignment, and sectoral relevance. The journey from identifying inefficiencies to overcoming them is complex, but India possesses both the vision and the tools to achieve it. If reforms are executed effectively and supported by proactive private-sector transformation, India's automotive export logistics system can shift from constraint to catalyst—enabling the sector to thrive in a competitive global trade environment.

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