

Anurag Hazarika¹
Samikshya
Madhukullya
Anwasha Hazarika

Research paper
DOI – 10.24874/QF.25.086



LOGISTICS AND SUPPLY CHAIN MANAGEMENT USING AI BETWEEN INDIA AND RUSSIA FOR A SUSTAINABLE FUTURE

Abstract: Artificial Intelligence (AI) has the potential to greatly improve sustainability and efficiency in supply chain management and logistics between India and Russia. With an emphasis on crucial areas including demand forecasting, inventory management, route optimization, and real-time tracking, this study investigates how AI may improve the logistics and supply chain industries in both nations in order to create a sustainable future. In order to comprehend the opportunities and difficulties in putting AI solutions into practice, the study uses a qualitative methodology and conducts in-depth interviews with supply chain managers, industry experts, and AI specialists. Thematic analysis and qualitative coding are two data gathering approaches that aid in finding trends and insights about AI applications in logistics. Additionally, the study assesses the prospective effects of AI technologies like machine learning, neural networks, and predictive analytics on enhancing operational performance, lowering carbon emissions, and promoting sustainable business practices. The partnership between Russia and India, two countries with different but complementary logistical requirements, presents a special chance to use AI to expedite international supply chains. By emphasizing sustainability, the study also looks at how AI may help logistics operations minimize their environmental impact, optimize resource utilization, and reduce waste.

This study adds to the expanding corpus of research on artificial intelligence (AI) in supply chain management and offers useful suggestions for industry participants wishing to use AI to improve sustainability.

Keywords: supply chain management, logistics, artificial intelligence, sustainability, India-Russia.

1. Introduction

The integration of Artificial Intelligence (AI) into logistics and supply chain management (SCM) between India and Russia presents a transformative opportunity for fostering a sustainable and resilient bilateral trade

ecosystem. As global trade dynamics evolve amid geopolitical shifts, climate challenges, and technological revolutions, AI emerges as a catalyst for enhancing efficiency, reducing carbon footprints, and strengthening the supply chain linkages between these two strategic partners. India and Russia share a historical partnership with a growing focus

¹ Corresponding author: Anurag Hazarika
Email: anuraghazarika2@gmail.com

on energy, defense, pharmaceuticals, and agriculture, which requires robust and intelligent logistics solutions. According to the Federation of Indian Export Organizations (FIEO), bilateral trade between India and Russia surged to over \$65 billion in FY 2023–24, a steep increase compared to \$13.1 billion in FY 2021–22, largely driven by oil imports from Russia (Ministry of Commerce & Industry, India, 2024). However, challenges such as long transit times, poor port connectivity, language and regulatory differences, and environmental sustainability concerns hinder further optimization. AI-enabled logistics systems—powered by machine learning, predictive analytics, natural language processing, and robotics—can address these bottlenecks by streamlining operations, forecasting demand accurately, managing warehouse inventory in real time, and minimizing fuel consumption. For example, AI-driven route optimization has the potential to reduce transportation costs by up to 15% and emissions by 20% (McKinsey & Company, 2022). The North-South Transport Corridor (INSTC), which connects India to Russia via Iran and Central Asia, could be a pivotal route for deploying AI-based smart logistics solutions. Incorporating AI into this corridor would enable real-time cargo tracking, automated customs clearance, and predictive maintenance for rail and road infrastructure, thereby reducing delivery time by up to 40% (Observer Research Foundation, 2023). In India, initiatives like the National Logistics Policy (Ministry of Commerce, 2022) and Unified Logistics Interface Platform (ULIP) provide digital frameworks that could integrate seamlessly with Russian digital customs systems under the Eurasian Economic Union (EAEU). Russia, on its part, has prioritized AI development through its “National AI Strategy 2030” and is investing in autonomous transport systems and smart warehousing. Leveraging this digital synergy, both nations can jointly invest in AI research and cross-border logistics

innovation hubs that focus on sustainable practices, such as green warehousing, electric vehicle corridors, and blockchain-enabled transparency. Furthermore, AI can enhance risk management by forecasting disruptions caused by geopolitical tensions, natural disasters, or pandemics—thereby ensuring continuity in supply chains. A joint AI Logistics Taskforce between India and Russia could facilitate knowledge sharing, regulatory harmonization, and the development of interoperable AI standards. This collaboration could also support sustainable development goals (SDGs), especially Goal 9 (Industry, Innovation and Infrastructure) and Goal 13 (Climate Action). As global supply chains shift toward resilience and sustainability, the Indo-Russian strategic partnership—augmented by AI-driven logistics—can become a blueprint for smart, secure, and green bilateral trade networks of the future.

2. Objectives

- To explore how Artificial Intelligence can optimize Indo-Russian multimodal logistics corridors (e.g., INSTC), enhancing trade efficiency and reducing environmental impact.
- To assess the role of AI-driven supply chain transparency and real-time analytics in fostering resilient and sustainable trade relations between India and Russia.

3. Methodology

The research adopts a qualitative methodology based on secondary sources to explore how Artificial Intelligence (AI) can optimize Indo-Russian multimodal logistics corridors, such as the International North-South Transport Corridor (INSTC), with a focus on enhancing trade efficiency and minimizing environmental impact. The study involves a comprehensive review and content analysis of existing literature,

including academic journals, policy papers, trade reports, government publications, and databases from international trade organizations. Additionally, data from industry white papers, AI and logistics case studies, and reports by think tanks focusing on supply chain innovation and India-Russia trade relations will be critically examined. Special emphasis will be placed on analyzing AI applications such as predictive analytics, route optimization, demand forecasting, and real-time tracking technologies. The study also assesses the role of AI-driven supply chain transparency and real-time analytics in building resilient and sustainable trade frameworks between the two nations. Findings will be synthesized to draw insights into best practices, potential challenges, and policy recommendations for future development.

4. Discussion and Findings

The advancement of Artificial Intelligence (AI) offers a transformative potential for enhancing the efficiency and sustainability of multimodal logistics corridors between India and Russia, especially along routes such as the International North-South Transport Corridor (INSTC). AI's capabilities in route optimization, real-time cargo tracking, and predictive maintenance provide significant scope for not only improving trade efficiency but also for minimizing environmental impacts associated with traditional logistics systems. With India and Russia increasingly investing in strengthening their strategic and economic ties, especially amidst evolving global trade dynamics and geopolitical realignments, leveraging AI becomes critical in reimagining the logistics framework underpinning this bilateral relationship.

The INSTC, a 7,200-kilometer multimodal transportation network connecting India to Russia via Iran, Azerbaijan, and Central Asia, serves as a key case study to explore how AI can optimize such long-haul

corridors. According to updates from the Federation of Freight Forwarders' Associations in India (FFFAI) and the UN Economic and Social Commission for Asia and the Pacific (UN ESCAP), the INSTC has seen renewed interest and progress in recent years. However, several operational bottlenecks—ranging from route congestion, inefficient cargo tracking, to delayed customs clearance—still pose challenges to realizing its full potential. Here, AI-driven route optimization algorithms can significantly contribute by analyzing historical traffic data, weather patterns, infrastructure status, and geopolitical risks in real time to suggest the most efficient routes. Such dynamic recalibration, enabled by machine learning models, reduces not only travel time and fuel consumption but also lowers carbon emissions by eliminating unnecessary detours and idling (UN ESCAP, 2023).

Additionally, AI-powered cargo tracking systems, using sensors and Internet of Things (IoT) technologies, can enhance visibility across the supply chain. With real-time updates on shipment locations, temperature-sensitive cargo conditions, and possible disruptions, logistics providers are better positioned to take preemptive actions. Predictive maintenance, another AI-driven capability, ensures that freight vehicles and infrastructure components like rail tracks, ports, and cranes are kept in optimal condition, reducing the chances of breakdowns or delays. These applications are particularly relevant for the INSTC, where multimodal connectivity—spanning sea, rail, and road—necessitates an intricate coordination of assets (FFFAI, 2022). When AI tools are integrated into fleet and asset management, companies can forecast equipment failures before they occur, thus avoiding sudden downtimes and reducing environmental costs associated with inefficiency and overuse.

Furthermore, the integration of AI into logistics operations can support India's broader sustainable development goals and

Russia's strategic interest in diversifying its trade routes. As both countries aim to reduce their carbon footprints and align with global sustainability benchmarks, the deployment of AI to enable green logistics becomes a shared imperative. AI-enabled carbon tracking platforms can provide exporters and policymakers with accurate data on emissions generated across the supply chain, facilitating more informed decisions to improve efficiency and sustainability.

Beyond operational enhancements, AI is equally instrumental in shaping resilient and transparent trade systems. Drawing on insights from McKinsey & Company and NITI Aayog, it is evident that AI-driven supply chain transparency contributes directly to the resilience of trade relationships. For instance, blockchain-integrated AI platforms provide a secure and immutable record of every transaction and movement within the supply chain. This transparency fosters trust between India and Russia, especially in a trade landscape susceptible to global disruptions such as sanctions, pandemics, or political tensions. When coupled with AI-based anomaly detection systems, such platforms can also quickly identify irregularities or potential fraud, thus strengthening the integrity of trade flows (McKinsey, 2021).

Real-time analytics powered by AI further enhances supply chain adaptability and resilience. For example, demand forecasting tools can assess market trends, consumer behavior, and geopolitical signals to predict fluctuations in trade volumes. This helps exporters and logistics firms align inventory management and shipment schedules accordingly, reducing both wastage and the risk of stockouts. The Russian Ministry of Industry and Trade, in its latest logistics modernization blueprint, emphasizes the importance of AI for inventory automation and adaptive planning, particularly for sectors such as energy, pharmaceuticals, and engineering goods—areas where India-Russia trade is growing (Russian Ministry of Industry and Trade, 2023).

Moreover, by integrating AI with customs and port clearance systems, both countries can streamline border processes, reducing time spent on documentation and inspections. AI-driven document verification and risk assessment systems can rapidly assess compliance, allowing low-risk consignments to be cleared faster while flagging potentially problematic ones. This reduces congestion at ports and checkpoints, improving overall logistics performance and reducing idle emissions from waiting vehicles. Such interventions can be particularly valuable along key transit points of the INSTC, including the Bandar Abbas port in Iran and Astrakhan port in Russia.

Sustainability, a cornerstone of modern trade discourse, finds a robust ally in AI. As global regulations tighten around environmental standards, businesses increasingly rely on digital tools to ensure compliance and improve green credentials. AI can help measure energy consumption, monitor packaging waste, and even suggest alternatives to carbon-intensive practices. For instance, through AI simulations, logistics firms can test different packaging materials or container-loading methods to identify the most sustainable options. This contributes not only to environmental conservation but also to cost savings, enhancing the competitiveness of India-Russia trade corridors.

It is also worth noting that the political will behind AI adoption in trade logistics is gaining momentum. NITI Aayog's policy paper on AI for All and India's National Logistics Policy both emphasize the role of emerging technologies in upgrading India's supply chain systems. On the Russian side, the national strategy on AI development outlines logistics as a priority sector for digital innovation. These policy synergies create a conducive environment for collaborative pilot projects, research partnerships, and capacity building, all of which are crucial to implementing AI at scale along Indo-Russian trade routes.

In conclusion, the convergence of AI and multimodal logistics in the India-Russia context presents a promising frontier for enhancing trade efficiency, fostering supply chain resilience, and promoting environmental sustainability. By optimizing routes, enabling real-time tracking, and automating key supply chain functions, AI can transform the operational landscape of initiatives like the INSTC. Simultaneously, AI tools that enhance transparency, forecasting, and sustainability metrics are essential for building a more trustworthy and adaptive bilateral trade framework. With the right investments, policy alignment, and international cooperation, the integration of AI into Indo-Russian logistics corridors can serve as a model for smart, green, and future-ready global trade systems.

5. Conclusion and Summary

The strategic use of Artificial Intelligence (AI) in enhancing the Indo-Russian multimodal logistics corridors—particularly the International North-South Transport Corridor (INSTC)—presents significant potential to redefine the operational, environmental, and economic aspects of bilateral trade. Based on the findings and insights from key secondary sources such as the Federation of Freight Forwarders' Associations in India (FFFAI), updates on INSTC operations, and logistics policy frameworks from the UN Economic and Social Commission for Asia and the Pacific (UN ESCAP), it becomes evident that AI can serve as a transformative tool in streamlining and optimizing logistics routes, cargo handling, and infrastructure efficiency. The incorporation of AI technologies such as intelligent route optimization algorithms, cargo tracking systems using machine learning, and predictive maintenance applications is poised to enhance not just the speed and reliability of freight movement, but also reduce unnecessary fuel consumption and carbon emissions, contributing to a more sustainable trade

ecosystem.

The INSTC, which connects India to Russia via Iran, Azerbaijan, and Central Asia, is an ambitious initiative intended to cut transit time and cost relative to traditional shipping routes via the Suez Canal. However, it currently faces a variety of operational challenges, including inconsistent infrastructure quality, bureaucratic delays, and unpredictable route conditions. AI can mitigate these challenges by enabling dynamic route planning based on real-time weather data, port congestion status, and geopolitical developments. Furthermore, AI-powered cargo tracking ensures greater visibility and security across complex, multimodal transit systems. This not only increases the reliability of the supply chain but also fosters trust among stakeholders operating in different national jurisdictions.

Moreover, predictive maintenance powered by AI analytics holds the promise of significantly reducing unplanned downtimes of transportation assets such as freight trains, shipping vessels, and trucks. AI models can analyze patterns in machinery data to forecast potential breakdowns before they occur, allowing for scheduled maintenance and minimal disruption to trade flows. This capability is particularly crucial for a corridor like the INSTC, which passes through multiple climatic zones and infrastructural conditions. By optimizing operational uptime, AI not only enhances the economic viability of the corridor but also conserves resources and energy—further reducing the environmental impact of logistics operations.

In a complementary vein, the role of AI in driving supply chain transparency and real-time analytics is central to forging a resilient and sustainable trade relationship between India and Russia. Drawing from research published by McKinsey & Company, NITI Aayog, and the Russian Ministry of Industry and Trade, it is clear that digital transparency in supply chains—enabled by AI-integrated technologies like blockchain—can play a

crucial role in minimizing fraud, eliminating unnecessary intermediaries, and ensuring compliance with trade regulations. Blockchain, when coupled with AI, allows for decentralized data verification and the real-time recording of all transactions and freight movements. This ensures that all parties involved have access to verifiable information, reducing disputes and enhancing collaboration.

Real-time analytics powered by AI tools also enable more agile decision-making. For instance, during times of global trade disruption—such as those caused by pandemics, geopolitical conflicts, or natural disasters—AI can rapidly assess alternative supply chain configurations and recommend contingency plans. This agility is vital for maintaining uninterrupted trade between India and Russia, especially as both nations look to diversify away from overdependence on traditional Western trade routes and systems. AI-based demand forecasting tools can also anticipate shifts in market needs and allow Indian and Russian exporters and importers to better align their inventory and production schedules. Inventory automation systems, underpinned by AI, reduce overstocking and understocking, thus optimizing warehouse operations and further lowering carbon footprints.

Another important dimension is the promotion of sustainability through AI-enhanced logistics and supply chain strategies. Both India and Russia have set ambitious targets for carbon neutrality and sustainable development. AI helps align logistics operations with environmental goals by recommending eco-friendly routes, optimizing load distribution, and minimizing idling time in freight handling. This not only reduces greenhouse gas emissions but also leads to cost savings for logistics operators, making sustainable practices economically viable. Additionally, data from UN ESCAP logistics frameworks highlights how AI can be used to monitor environmental compliance and suggest adaptive strategies for greener transport policies.

Cultural and operational differences between Indian and Russian trade environments often pose hurdles to seamless coordination. However, AI-driven platforms can bridge these gaps by standardizing communication protocols, translating and interpreting trade documentation, and even predicting potential cultural or regulatory conflicts before they arise. Such tools foster smoother collaboration and reinforce the resilience of bilateral trade mechanisms.

Overall, the integration of AI into Indo-Russian logistics and trade relations is not just a technological upgrade—it is a strategic imperative for economic, environmental, and geopolitical sustainability. By enhancing the operational efficiency of the INSTC and similar corridors, improving supply chain transparency, and driving sustainability through real-time analytics, AI can serve as a cornerstone of a modern, resilient, and mutually beneficial trade partnership. The use of AI in this domain reflects a broader shift in global trade where digital innovation and sustainable development go hand in hand. For India and Russia, leveraging AI effectively will not only enhance their bilateral trade competitiveness but also demonstrate leadership in reimagining global logistics for a multipolar and climate-conscious world.

6. Recommendations and Suggestions

Based on the outlined objectives and the supporting secondary sources, it is recommended that India and Russia jointly invest in the integration of Artificial Intelligence technologies across key segments of their multimodal logistics corridors—particularly the International North-South Transport Corridor (INSTC)—to enhance trade efficiency and environmental sustainability. Leveraging AI-driven tools for route optimization, real-time cargo tracking, and predictive maintenance can significantly reduce transit times, operational costs, and carbon

emissions. The reports from the Federation of Freight Forwarders' Associations in India (FFFAI), INSTC updates, and UN ESCAP logistics papers consistently highlight inefficiencies and fragmentation in existing logistics networks. These challenges can be addressed through AI-based systems capable of dynamically adjusting to real-time conditions, thereby enhancing the responsiveness and adaptability of the India-Russia trade corridor.

Furthermore, the deployment of AI for supply chain transparency and real-time analytics is crucial for fostering resilient and sustainable trade relations. Drawing from insights provided by McKinsey, NITI Aayog, and the Russian Ministry of Industry and Trade, AI applications such as

blockchain-enabled logistics platforms, advanced demand forecasting algorithms, and intelligent inventory management can improve traceability and accountability throughout the supply chain. This fosters greater trust among stakeholders, reduces delays due to miscommunication or opacity, and aligns with global standards for green and responsible trade. It is therefore suggested that both governments facilitate public-private partnerships, pilot AI demonstration projects on the INSTC, and build institutional capacities for AI adoption in logistics. In doing so, Indo-Russian trade can not only become more robust and future-ready but also a model for sustainable connectivity in the broader Eurasian region.

References:

- Federation of Freight Forwarders' Associations in India (FFFAI). (2022). *Annual Logistics Report*.
- Federation of Indian Export Organisations (FIEO), Trade Data 2023–24
- Government of Russia, "National AI Strategy 2030"
- McKinsey & Company (2022). *Automation in Logistics: Big Efficiency, Bigger Sustainability*.
- McKinsey & Company. (2021). *Digital Supply Chains: AI-Driven Resilience in Trade*.
- Ministry of Commerce (2022). *National Logistics Policy*. India.
- Ministry of Commerce and Industry, Government of India, 2024
- NITI Aayog. (2021). *AI for All: India's National Strategy for Artificial Intelligence*.
- Observer Research Foundation (ORF) (2023). INSTC and the AI Opportunity, Policy Brief, 2023
- Russian Ministry of Industry and Trade. (2023). *Logistics Modernization Strategy and AI Integration*.
- UN ESCAP. (2023). *Sustainable and Smart Transport Corridors in Asia*.

Anurag Hazarika
Faculty of Business
Administration and
Management, 21st Century
Open University,
USA
anuraghazarika2@gmail.com
ORCID 0000-0002-0005-4813

Samikshya Madhukulya
21st Century Open University,
USA
ORCID 0009-0002-1206-1284

Anwasha Hazarika
Cotton University,
Assam,
India
ORCID 0009-0007-3660-071X
