

National Seminar on Effect of Ecopreneurship on Environment Protection & Sustainable Development

The Role of the Sagarmala Project in Helping Indian Businesses Achieve ESG Goals

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Abstract

Introduction: The Sagarmala Project, an ambitious initiative by the Government of India, is designed to modernize port infrastructure, enhance logistics efficiency, and promote coastal economic development. As businesses increasingly align with Environmental, Social, and Governance (ESG) principles, this project provides a significant opportunity to support sustainability, social responsibility, and transparent governance. With over 7,500 km of coastline and vast inland waterways, India holds significant potential for maritime-led development, and the initiative plays a pivotal role in reducing logistics costs and increasing the competitiveness of Indian businesses in global trade.

Methodology: The study uses a systematic literature review to compare road and maritime transport in terms of cost, emissions and efficiency. The theoretical framework is based on ESG principles to assess maritime sustainability. Model selection uses comparative models of road versus sea transport, evaluating cost per ton-km to assess economic feasibility, emission outputs to quantify environmental benefits, and operational efficiency metrics such as cargo capacity and fuel consumption rates. An ESG assessment framework is incorporated to measure the Sagarmala Project's impact on corporate sustainability, carbon reduction and supply chain resilience. A conceptual framework is developed to illustrate the relationship

between transportation mode selection, carbon emissions and logistics costs, and ESG performance improvements through coastal and inland water transport.

Results & Discussion: Maritime transport cuts emissions by up to 40% and costs by 30% compared to road transport (Rodrigue et al., 2020; World Bank, 2022), while Kumar and Patel (2021) estimate that port-led development under Sagarmala could cut India's carbon footprint by 33-35% by 2030. Coastal shipping consumes only 10% of the energy required for road transport, and a standard cargo ship can move one ton of goods approximately 500 km per litre of fuel against 50-100 km for a truck, making sea transport nearly 5-10 times more fuel-efficient. Ships can carry up to 200,000 tons of cargo compared with 20-40 tons per truck. India's road network spans 6.4 million km and manages 64.5% of freight; the project aims to shift 25-30% of road freight to maritime transport. Transitioning could reduce logistics costs by 30-50% while cutting CO₂ emissions by 80%, given that road transport accounts for 75% of transport-related CO₂ emissions against 11% from shipping. The project is expected to create over 10 million jobs and has mobilised over ₹5 lakh crore in investments, supported by a 40% discount on vessel and cargo charges and a GST reduction on bunker fuels from 18% to 5%.

Conclusion: The Sagarmala Project presents a transformative opportunity for Indian businesses to embed Environmental, Social, and Governance principles into their operations. By enhancing logistical efficiency, reducing environmental impact, and promoting social inclusivity, it serves as a model for sustainable economic growth while aligning with India's global ESG commitments. Sea transport offers a significantly more fuel-efficient, cost-effective and environmentally friendly alternative compared to road transport, and with policy incentives, infrastructure development and increased private sector involvement, coastal shipping can revolutionize India's supply chain. To ensure long-term success, it is essential to address last-mile connectivity issues and streamline regulatory frameworks.

Keywords: Sagarmala Project; ESG; Coastal Shipping; Maritime Logistics; Carbon Emissions; Green Ports; Port Infrastructure; Modal Shift; Circular Economy; India.

1. Introduction

India's maritime sector is a key contributor to economic growth, trade, and employment (Ministry of Ports, Shipping and Waterways, 2021). With over 7,500 km of coastline and

vast inland waterways, India holds significant potential for maritime-led development (World Bank, 2021). Recognizing this, the Government of India launched the Sagarmala Project in 2015 to modernize port infrastructure, improve logistics efficiency, and boost regional economies (CII, 2023). The project aims to reduce logistics costs, integrate transport systems, and enhance India's global trade competitiveness (IMO, 2022).

As global trade shifts toward ESG (Environmental, Social, Governance)-focused strategies, aligning maritime infrastructure with sustainability goals becomes vital (Indian Ports Association, 2022). Sagarmala plays a pivotal role in promoting ESG through reduced emissions, social development, and improved governance (NITI Aayog, 2022). This paper evaluates the project's ESG integration, benefits, challenges, and policy implications.

2. Literature Review

2.1 Sustainable Maritime Logistics

Studies show that coastal and inland shipping reduce carbon emissions and logistics costs significantly compared to road transport. Rodrigue et al. (2020) and the World Bank (2022) note maritime transport cuts emissions by up to 40% and costs by 30%. Kumar & Patel (2021) estimate that port-led development under Sagarmala could cut India's carbon footprint by 33-35% by 2030. Technological advancements like real-time tracking and blockchain improve transparency and operational efficiency (OECD, 2022). Coastal shipping also reduces highway congestion and road damage (IMO, 2023).

2.2 ESG Integration in Sagarmala

- **Environmental:** Coastal shipping consumes only 10% of the energy required for road transport (World Bank, 2021). Port initiatives include solar energy, LNG-fueled vessels, and shore-to-ship power (IMO, 2022).

- **Social:** The project is expected to create over 10 million jobs and support fisheries, local communities, and skill development (Ministry of Skill Development, 2023; FAO, 2022).
- **Governance:** Digitization of port operations and public-private partnerships (PPPs) enhance transparency and efficiency, mobilizing over ₹5 lakh crore in investments.

2.3 Environmental Impact and Circular Economy

- **Carbon Footprint:** Shifting freight from road to sea reduces CO₂ by up to 60% per ton-km (MoPSW, 2021).
- **Green Ports:** Initiatives include renewable energy, wastewater recycling, and solid waste management (IMO, 2022).
- **Ecosystem Conservation:** Eco-sensitive port designs and mangrove restoration are key sustainability features (NIO, 2020).
- **Circular Economy:** Promotes recycling, reuse of industrial waste, and eco-friendly construction (MoEFCC, 2023).

3. Methodology

This study uses a systematic literature review to compare road and maritime transport in terms of cost, emissions, and efficiency.

- **Theoretical Framework:** Based on ESG principles to assess maritime sustainability.
- **Model Selection:** Uses comparative models of road vs. sea transport, measuring cost per ton-km, fuel consumption, emissions, and ESG impact.

3.1 Model Selection & Adoption

To compare transport efficiency, the study adopts comparative models of road and sea transport, evaluating:

- Cost per ton-km to assess economic feasibility.
- Emission outputs to quantify environmental benefits.

- Operational efficiency metrics, such as cargo capacity and fuel consumption rates.

Additionally, an ESG assessment framework is incorporated to measure the Sagarmala Project's impact on corporate sustainability, carbon reduction, and supply chain resilience.

3.2 Conceptual Framework

A conceptual framework is developed to illustrate the relationship between:

- Transportation mode selection (road vs. sea).
- Carbon emissions and logistics costs.
- ESG performance improvements through coastal and inland water transport.

This framework demonstrates how shifting freight movement from road to sea under the Sagarmala Project enhances sustainability, reduces logistics costs, and contributes to India's carbon reduction commitments.

4. Theoretical Analysis

The exceptional efficiency of ships stems from the significantly lower resistance of water compared to the friction experienced by road vehicles on asphalt or concrete. This reduced friction enables ships to transport vast loads with minimal fuel consumption per unit weight, enhancing both the cost-effectiveness and sustainability of maritime logistics (SpringerLink, 2023; World Bank, 2021).

As per the International Maritime Organization (IMO), a standard cargo ship can move one ton of goods approximately 500 km per liter of fuel, whereas a truck can transport the same tonnage only 50-100 km per liter (IMO, 2023). This highlights that sea transport is nearly 5-10 times more fuel-efficient than road transport.

4.1 Current Freight Transport Trends in India

India's road network spans 6.4 million km, managing 64.5% of the country's freight (Insights IAS, 2024). However, road transport is plagued by inefficiencies such as

congestion, high fuel consumption, and rising logistics costs (Ministry of Road Transport & Highways, 2024).

4.2 Potential for Modal Shift to Sea Transport

The Sagarmala Project aims to shift 25-30% of road freight to maritime transport, particularly bulk commodities like coal, petroleum, and fertilizers (NITI Aayog, 2025). Given that ships can carry up to 200,000 tons of cargo, compared to just 20-40 tons per truck (IMO, 2023), the transition to coastal shipping offers substantial economic and environmental benefits.

4.3 Infrastructure Challenges

Despite its advantages, maritime transport faces key challenges, including inadequate port infrastructure, limited last-mile connectivity, and regulatory hurdles (NITI Aayog, 2025). To enable a seamless shift, investments in port modernization and policy incentives are essential.

4.4 Environmental and Cost Benefits

Theoretical models suggest that transitioning to maritime transport can reduce logistics costs by 30-50% while cutting CO₂ emissions by 80% (World Bank, 2023). The World Bank (2023) further highlights that road transport accounts for 75% of transport-related CO₂ emissions, compared to just 11% from shipping. Additionally, the adoption of hybrid and LNG-powered vessels under the Sagarmala initiative is expected to further reduce the carbon footprint of India's freight sector.

5. Discussion

Despite its efficiency, maritime transport in India faces challenges such as longer transit times, infrastructure gaps, and limited last-mile connectivity. However, the Sagarmala Project addresses these challenges by investing in port modernization, multimodal logistics parks, and digital tracking systems, making sea transport a viable alternative to

road transport (Ministry of Ports, Shipping and Waterways [MPSW], 2023a). Additionally, the project promotes public-private partnerships (PPPs) to enhance port efficiency and develop integrated logistics hubs (MPSW, 2023a).

The role of government incentives and policy frameworks in encouraging businesses to adopt coastal shipping is also significant. Several measures, such as a 40% discount on vessel and cargo-related charges for coastal vessels, priority berthing policies, and a reduction in GST on bunker fuels (from 18% to 5%), have been introduced to support coastal shipping growth (MPSW, 2023b).

Moreover, the social impact of Sagarmala is noteworthy. By fostering port-led development, the project has the potential to generate large-scale employment in coastal regions, helping reduce rural-to-urban migration (Press Information Bureau [PIB], 2023a). It also enhances social inclusivity by improving connectivity to remote coastal communities, which facilitates economic opportunities for small and medium enterprises (SMEs) involved in trade and logistics. Furthermore, the project includes skill development programs aimed at strengthening India's maritime workforce (PIB, 2023b). From a governance perspective, Sagarmala enhances transparency and efficiency in India's supply chain management. The project integrates digital tools such as blockchain technology, GPS-based cargo tracking, and automated port operations, ensuring accountability and reducing bureaucratic inefficiencies (MPSW, 2023a). Policy interventions under Sagarmala also emphasize adherence to global environmental regulations, ensuring that businesses operating within the maritime sector comply with international Environmental, Social, and Governance (ESG) benchmarks (PIB, 2023a).

5.1 India's Road Transport Challenges and the Shift to Coastal Shipping

India's road transport sector, despite rapid expansion under projects like Bharatmala Pariyojana, continues to face urban congestion, high logistics costs (14% of GDP), and

road safety concerns (NITI Aayog, 2024). The Sagarmala Project aims to address these inefficiencies by shifting a portion of freight transport from road to sea (MPSW, 2023b).

5.2 Potential for Shifting Road Freight to Sea

According to NITI Aayog, approximately 25% to 30% of India's road freight can be transitioned to sea transport, particularly for bulk commodities such as:

- **Coal and Iron Ore** – Major shipments can be diverted along the East Coast (Kolkata to Chennai).
- **Petroleum and Chemicals** – Ideal for movement along the West Coast (Kandla-Mumbai-Cochin).
- **Food Grains and Fertilizers** – Suitable for transport via Gujarat-Maharashtra industrial corridors (NITI Aayog, 2024).

5.3 Challenges in Modal Shift to Sea Transport

Although shifting freight from roads to waterways offers multiple advantages, some obstacles remain:

1. **Port Infrastructure Development** – Many minor ports lack efficient cargo handling facilities for bulk and containerized shipments (MPSW, 2023a).
2. **Last-Mile Connectivity** – Integrating sea transport with road and rail networks is essential for seamless logistics operations (PIB, 2023a).
3. **Regulatory Barriers** – Coastal shipping policies need simplification and financial incentives to attract businesses to this mode (NITI Aayog, 2024).

5.4 Challenges & Areas for Improvement

Despite its achievements, Sagarmala faces challenges such as land acquisition delays, financing constraints, and environmental concerns (NITI Aayog, 2023). To maximize its ESG impact:

- Stronger implementation of green technologies is needed, such as electric-powered cargo handling (IEA, 2022).
- Better coordination between state and central agencies can help overcome regulatory bottlenecks (Ministry of Commerce & Industry, 2023).
- More investments in training and reskilling programs will ensure long-term employment benefits (ILO, 2023).

6. Conclusion

The Sagarmala Project presents a transformative opportunity for Indian businesses to embed Environmental, Social, and Governance (ESG) principles into their operations. By enhancing logistical efficiency, reducing environmental impact, and promoting social inclusivity, it serves as a model for sustainable economic growth while aligning with India's global ESG commitments. Addressing policy refinements and fostering stakeholder engagement will further strengthen its impact.

Sea transport offers a significantly more fuel-efficient, cost-effective, and environmentally friendly alternative compared to road transport. While road networks remain vital for last-mile connectivity and short-distance logistics, expanding coastal shipping can improve overall transportation efficiency. Encouraging policies under the Sagarmala Project can drive cost reductions and lower carbon emissions, strengthening India's position in global trade.

With policy incentives, infrastructure development, and increased private sector involvement, coastal shipping can revolutionize India's supply chain while enhancing ESG ratings and ensuring long-term sustainability. The Sagarmala Project marks a strategic shift in India's logistics landscape, positioning coastal shipping as a cost-effective and environmentally sustainable alternative to road transport. Government initiatives, infrastructure investments, and policy reforms are driving this transformation.

However, to ensure long-term success, it is essential to address last-mile connectivity issues and streamline regulatory frameworks (MPSW, 2023b; PIB, 2023b).

The Sagarmala Project is a game-changer in India's logistics and maritime sector, fostering ESG-driven development. By integrating green energy solutions, enhancing social inclusivity, and improving governance, the project positions India as a global leader in sustainable trade. Future advancements in AI-driven port management, automation, and alternative fuels will further enhance its contribution to India's net-zero commitments and long-term economic prosperity (IEA, 2023). With continuous policy support and innovation, Sagarmala can serve as a model for sustainable infrastructure development worldwide.

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