FICCI

Sustainable multimodal logistics:

A vision and green logistics paradigm

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CRISIL
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Analytical contacts

CRISIL Ltd

Jagannarayan Padmanabhan

Senior Director and Global Head – Transport, Logistics and Mobility, CRISIL

jagannarayan.padmanabhan@crisil.com

FICCI

Neerja Singh

Assistant Secretary General – Logistics, Infrastructure (Transport and Urban)

(Roads and Highways, Road Safety, Ports and Shipping, Railways, Urban Development, Real Estate and Smart Cities)

neerja.singh@ficci.com

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Foreword FICCI



Mr Rizwan Soomar

Chairman, FICCI Committee on Logistics

and

CEO & Managing Director- North Africa & India Subcontinent, DP World

I am delighted to share this report, Sustainable multimodal logistics: A *vision and green logistics paradigm* released at the *PM GatiShakti Summit: Towards Integrated Infrastructure Planning and Logistics Efficiency*, organised by the Federation of Indian Chambers of Commerce and Industry (FICCI). This report provides insights into the initiatives launched by the Government of India for the infrastructure and logistics sector, such as GatiShakti and National Logistics Policy (NLP).

In an era defined by dynamic global trade, the honourable Prime Minister's vision of GatiShakti emphasises on multimodal transportation, illustrated by dedicated freight corridors (DFCs) and GatiShakti multimodal cargo terminals (GCTs). Sustainability is one of the most important elements around which most business discussions are focussed today.

The report's focus on green warehousing, packaging and transportation signifies a progressive step toward environmentally responsible practices in the logistics sector. This strategic shift is aimed at not only mitigating the industry's environmental impact but also aligns with the global sustainability goals. The report underscores the importance of embracing green logistics as a catalyst for positive change, ensuring that our endeavours contribute to a more ecologically conscious and sustainable future.

This report also delves into the Unified Logistics Interface Platform (ULIP), the digital cornerstone reshaping the logistics narrative. ULIP, with its focus on transparency and efficiency, emerges as a vital element for a smoother and faster logistics process.

Green financing, as highlighted in the report, emerges as a key enabler for the ambitious initiatives outlined by GatiShakti and NLP. The intersection of economic dynamics with sustainable priorities is a critical area requiring attention and coordination. The economic instruments outlined in the report lay the foundation for public-private partnerships, essential for developing a green export policy.

The inclusion of global interventions through case studies adds a valuable perspective. The challenges faced by the logistics industry are universal, and success stories from California to Saudi Arabia and London will help us learn and imbibe from global best practices.

Recent government initiatives, including the NLP, New Warehousing Policy, and the focus on Multi-Modal Logistics Parks, have been instrumental in reshaping India's logistics landscape. GatiShakti's vision, incorporating ULIP, DFCs and GCTs, reflects a commitment to efficiency, sustainability and technological advancement. These efforts collectively drive the sector towards increased integration, reduced costs, and global competitiveness.

Considering the future prospects and management challenges, it is evident that GatiShakti and NLP are indispensable in steering India towards a greener and more efficient future. The government's commitment to sustainable development aligns seamlessly with the country's vision of developing a robust export sector that is not only efficient but also socially and environmentally friendly.

I hope you will find this report useful. We welcome your suggestions and feedback.

Warm regards,

Message from CRISIL



Ashutosh Bhandari

Senior Practice Leader and Director,

Transport, Logistics and Mobility
CRISIL- Market Intelligence & Analytics

Indian logistics sector comprises the inbound and outbound segments of the manufacturing and service supply chains. Of late, the shipping and logistics infrastructure has received a lot of attention both from business and industry as well as policy makers – posing tremendous opportunities for development across different avenues.

With the dynamics of global commerce evolving at an unprecedented pace, the role of efficient logistics in economic growth and sustainability cannot be ignored. It is with great pleasure that we introduce this report, a collaborative endeavour by the Federation of Indian Chambers of Commerce and Industry (FICCI) in association with CRISIL as the knowledge partner.

This report meticulously examines the landscape of logistics in India, offering a deep dive into initiatives and schemes aimed at enhancing efficiency. It provides a critical analysis of India's Logistics Performance Index and delves into the initiatives fostering logistics excellence in our nation. As we navigate the dynamic landscape of logistics, this report sheds light on the transformative journey propelled by the visionary initiative of PM GatiShakti, steering India towards a future marked by efficiency and data-driven development. The integration of advanced technology within the framework of PM GatiShakti, has been instrumental in achieving this paradigm shift. The report details how PM GatiShakti ensures multimodal connectivity through digital infrastructure and the ULIP. Furthermore, the impact of PM GatiShakti on enhancing the competitiveness of Indian industries is commendable. The reduction of logistics costs to the current range of 7.9% to 8.9% for fiscal 2022 of the gross domestic product to more sustainable levels showcase a commitment to fostering economic growth. Crucially, the report advocates for sustainable logistics practices, emphasising reduced vehicular movement, low-carbon travel modes, warehouse optimisation, green packaging, and technology integration. It calls for a comprehensive policy framework, targeting campaigns, regulatory standards, subsidies and incentives across all levels of government.

A significant aspect explored in this report is the concept of green logistics. It unravels the drivers behind green logistics and elucidates its key pillars, including sustainable warehousing, green packaging, and standardisation. Drawing from global practices, the report examines solutions that minimise the environmental impact of logistics. Additionally, it provides a detailed analysis of current green logistics interventions in India, offering insights into prospects and the challenges that lie ahead.

I commend FICCI and CRISIL for their tireless efforts in compiling this insightful report, which serves as a valuable resource for policymakers, industry leaders and all stakeholders involved in shaping the future of logistics in India. I am hopeful that the findings and recommendations will guide our collective efforts toward a more efficient, sustainable and globally competitive logistics ecosystem.

Executive summary

This knowledge report covers the dynamic landscape of India's logistics, spotlighting the interconnected threads that weave efficiency and sustainability into the fabric of the nation's logistical ability.

Government initiatives like the National Logistics Policy (NLP), fostering logistics efficiency across sub-national and national levels, reflect a holistic strategy. From the granularity of the (Logistics ease across different states) LEADS study at the sub-national tier, identifying and rectifying inefficiencies, to the overarching Production Linked Incentive (PLI) scheme at the national level, driving manufacturing prowess, each of the above initiatives contribute to a comprehensive framework. Also, India's noteworthy ascent in the World Bank's Logistics Performance Index (LPI), serves as a testament to the nation's commitment to navigating the global logistics landscape with assurance. At the heart of this transformative journey lies PM GatiShakti, orchestrating multimodal connectivity through the Unified Interface Platform (ULIP). Seamlessly bridging digital initiatives for trade facilitation with the coordinated planning of infrastructure projects, PM GatiShakti emerges as a linchpin, optimising multimodal connectivity and logistics efficiency while charting a course towards green logistics.

This report highlights the need for an imperative shift towards green logistics, unveiling the concept's essence and drivers. It explores the global best practices, identifies current interventions in India, and projects a visionary outlook while acknowledging the challenges inherent in transitioning to sustainable practices.

As we contemplate the road ahead, the report outlines the impact of PM GatiShakti and how green logistics can articulate strategic recommendations, and underscore collaboration opportunities for a sustainable logistical future. It beckons towards a future where logistics seamlessly integrates with environmental stewardship, marking a paradigm shift towards efficiency and sustainability. This knowledge report serves as a compass, guiding stakeholders through the intricate trajectory of India's logistical transformation, emphasising the symbiotic relationship between efficiency and environmental consciousness.





India’s logistics landscape

As the Indian economy continues to grow and evolve, the significance of efficient and effective movement of goods cannot be overstated. In today’s interconnected world, shipping and logistics stand at the heart of the economy, serving as crucial gateways for international trade and commerce. Indian logistics sector comprises the inbound and outbound segments of the manufacturing and service supply chains. The logistics sector represents 5% of India’s gross domestic product (GDP) and employs 2.2 crore people. India handles 4 billion tonne of goods each year, amounting to a total annual cost of Rs 9.5 lakh crore. These goods represent a variety of domestic industries and products: agricultural goods (22%), mining products (39%), and manufacturing-related commodities (39%).[1]

Overview – India's logistics landscape

India’s transportation and logistics sector is the key driver of the fast-paced growth poised to achieve in the next 25 years. The sector handles ~10,000 commodities and employs ~22 million people. It is one of the most highly fragmented sectors, with only 10% of the sector operated by organised players. Freight movement is heavily skewed towards road transportation, which moves ~66% of cargo (in tonne-km). It is followed by rail (~30%), shipping (~3%) and air (~1%). The figure below provides a comprehensive overview of the transportation and logistics landscape[2].

[1] *NITI Aayog, RMI, RMI India*
[2] *India Brand Equity Foundation (IBEF)*

Figure 1: India's transportation and logistics sector

1. Modal split – freight movement in India

Road Share	Rail Share	Shipping & IWT Share	Air Share
~ 66%	~ 30%	~3%	~1%

2. Modal Infrastructure

Road **63.73** lakh km	Rail **1.26** lakh km	**12** Major ports and **200+** minor ports	Airports **148**

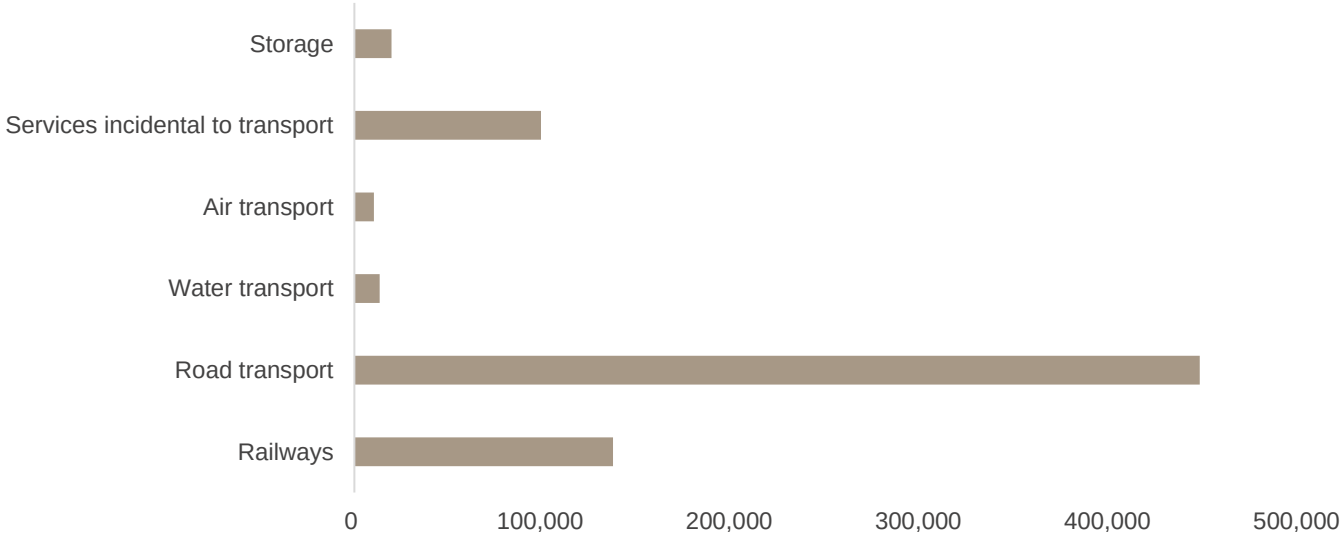
3. Logistics Infrastructure

Total number of ICD	Total number of CFS	Total number of MMLP	
129	168	1*	**300** m sq. m. warehouse space

Source: Niti Aayog, National Rail Plan, Ministry of Ports, Shipping and Waterways, Press Information Bureau (PIB)
**Under development*

Sector-wise gross value added for fiscal 2021 is given below (in Rs crore).

Figure 2: Sector-wise gross value added for FY21 (INR crore)



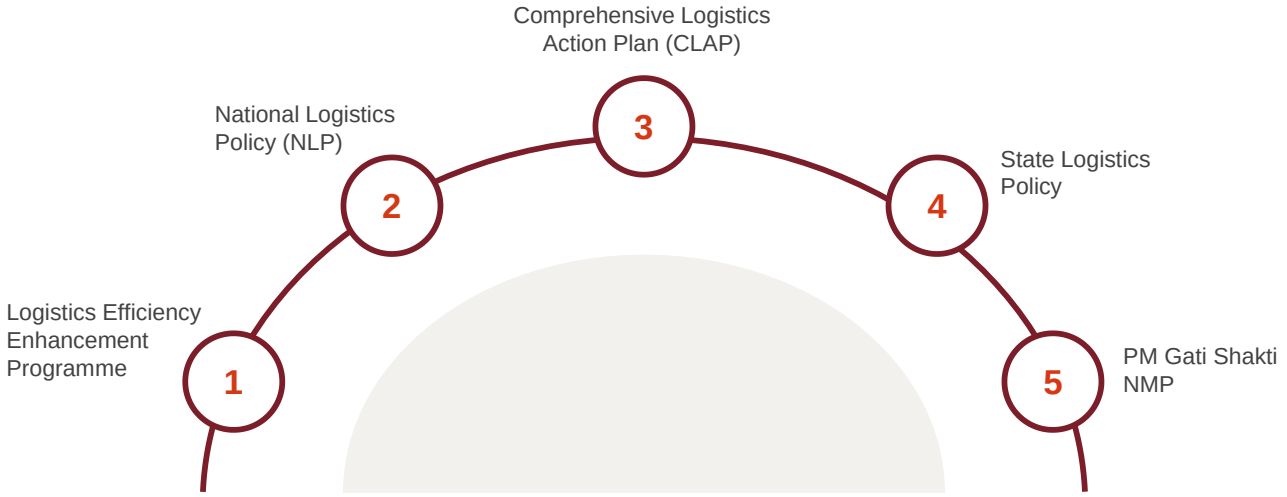
Source: Ministry of Commerce and Industry

Initiatives and schemes driving logistics efficiency

Logistics, the backbone of India's international trade, aids in the diversification of not only the country's exports but also of products manufactured in other countries. To improve the ease of doing business and the liveability quotient, the government launched the National Logistics Policy (NLP) in 2022. The policy aims to lower the cost of logistics and bring it on par with other developed countries. This will increase the competitiveness of Indian products in both the home market and the international market. Moreover, the reduced cost will increase efficiency efforts across all sectors of the economy, which will encourage value addition and enterprise.[3]

In addition to NLP, the government has implemented a range of initiatives to boost the logistics sector. One notable effort involves the development and enhancement of key infrastructure, such as ports, highways and rail networks, to streamline transportation and reduce bottlenecks. Additionally, digitalisation has been a focal point, with the introduction of technologies like FASTag and Port Community System, aiming to optimise supply chain management and enhance overall efficiency. These comprehensive measures collectively aim to propel the logistics sector into a more agile and responsive force, driving national economic development. Some of the key initiatives taken by the government are shown in the figure below.

Figure 3: Key initiatives taken in the logistics sector in past few years

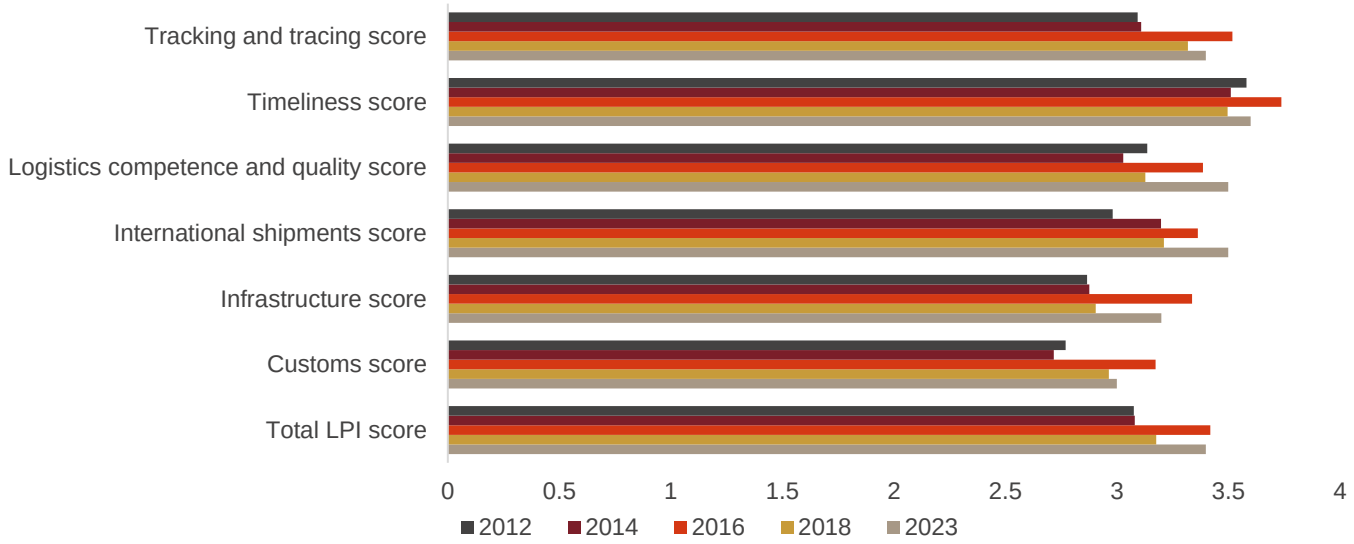


India ascending: A positive surge in World Bank LPI ranking

India's commendable ascent in the World Bank's Logistics Performance Index (LPI) noteworthy, climbing six places to secure the 38th rank out of 139 countries in the 7th edition of the index for 2023.[4] This remarkable improvement can be attributed to the initiatives discussed above, signalling India's steadfast commitment to enhancing logistics efficiency. Across the six LPI indicators, India has demonstrated substantial progress, showcasing the tangible impact of concerted efforts.

[3] *Invest India Report - National Logistics Policy in India, 2022*
[4] *World Bank LPI Report 2023*





Source: World LPI Report 2023

At the sub-national level, the Department for Promotion of Industry and Internal Trade has played a pivotal role through its LEADS study initiated in 2018. This study has effectively identified and resolved logistics inefficiencies, fostering improved trade facilitation across diverse supply chains. Nationally, India has implemented strategic measures such as the Production Linked Incentive (PLI) scheme, specifically designed to boost manufacturing capabilities. Also, initiatives like Sagarmala, focusing on enhancing connectivity to ports and reducing cargo dwell time, and Bharatmala, dedicated to enhancing road connectivity along major corridors, have collectively contributed to India's significant advancement in logistics efficiency.[5]

[5] *Press Information Bureau*



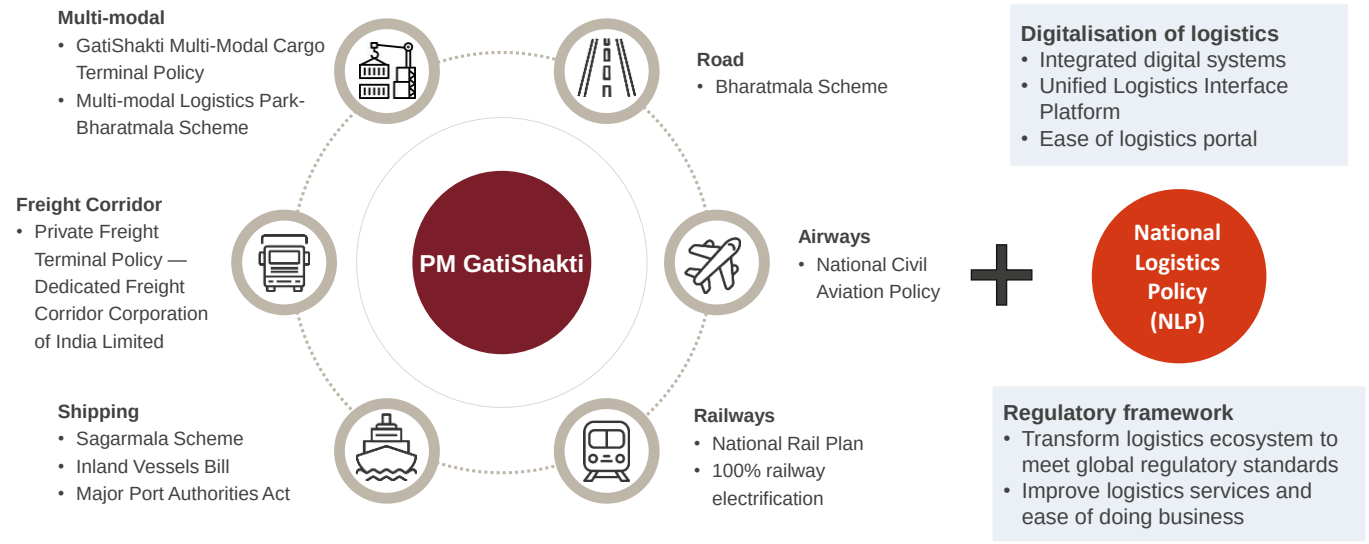
PM GatiShakti: How India is revolutionising integrated planning and multimodal connectivity

As discussed in the earlier sections, the Government of India has committed a historic capital expenditure outlay across infrastructural assets including roads, railways, ports, telecommunications, power, and renewable energy. The country's diversity and scale warrant an integrated approach to bringing about ease of living for citizens and ease of doing business within and outside the country.

To support the underlying logistics ecosystem and leapfrog manufacturing efficiency, efforts are being made to lower the time and cost of planning and implementing projects.

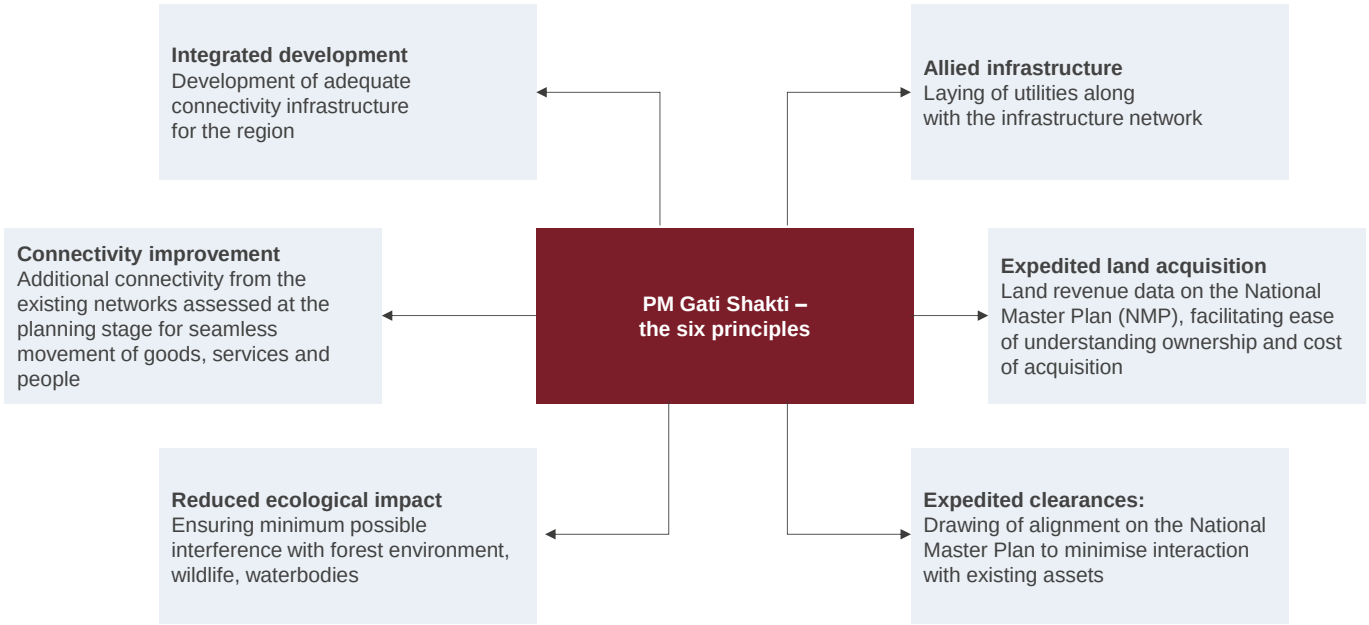
This presents an opportunity for enhanced collaboration between different departments — for instance, coordination of road construction with, say, laying of underground cables, pipelines and so on — which could optimise resources and minimise inconvenience, fostering efficient development. The Cabinet Committee on Economic Affairs on October 21, 2021, cleared the PM GatiShakti – National Master Plan (GSNMP) for providing multimodal connectivity to various economic zones. The plan is intended to break down silos, introduce holistic planning within departments and ensure seamless functioning across multiple infrastructure projects.

Figure 4: PM GatiShakti complementing NLP[6]



PM GatiShakti is radically transforming the approach to integrated planning for multimodal infrastructure connectivity boosting India's socio-economic growth and is dependent on the following six pillars.

Figure 5: Principles of PM GatiShakti



[6] *Envisioning the Future of Indian Logistics@2047*

Figure 6: Key achievements under PM GatiShakti[7]-

1463	50+	100+	2,000+	200	156	60+
Data layers integrated	Planning tools	Projects evaluated by NPG	Interministerial issues resolved	Projects of states recommended	Last- and first-mile connectivity projects identified	Central and state individual portals

Examples of projects under PM GatiShakti

Jogighopa Multimodal Logistics Park

The National Master Plan helped plan a multimodal logistics park at the intersection of national waterways, rail network and roadways, connected to the rest of India and supplemented by a four-lane bridge across the Brahmaputra river, drastically reducing the existing travel distance and time.

Pune-Bengaluru Expressway

PM GSNMP helped minimise the ecological impact of the expressway, while maximising the economic and social connectivity in a multimodal manner. Along the way, it enabled faster clearances and a drastic reduction in travel time, leading to extensive fuel savings, thus reducing carbon footprints.

Digital infrastructure and ULIP

As part of PM GatiShakti, NLP is a comprehensive policy to address cost and inefficiency issues by laying down a comprehensive interdisciplinary, cross-sectoral and multi-jurisdictional framework for developing an entire digital logistics ecosystem. The goal of this policy is to enable efficiency and lower costs in the logistics industry.

Four key steps to be undertaken for NLP:

- **Integration of digital system:** Digital integration of the different systems of seven different departments (such as road transport, railways, aviation, commerce ministries and foreign trade)
- **ULIP:** Will ensure shorter and smoother cargo movement and enable real-time confidential information exchange
- **Ease of logistics:** Will enable and ensure the ease of the logistics business through transparency and accessibility
- **System improvement group:** Will monitor all logistics-related projects regularly[8]

ULIP

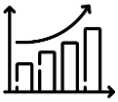
At the heart of PM GatiShakti's transformative agenda lies ULIP, a key instrument to revolutionise connectivity within India's logistics landscape. It serves to seamlessly integrate the diverse facets of the logistics ecosystem to foster efficiency, transparency, and optimal coordination. It is designed to also reduce the cost of logistics by creating a transparent, one-window platform that can provide real-time information to all stakeholders. It was also emphasised that the solution should have the visibility of multi-modal transport, and that all the existing systems of various ministries, governing bodies and private stakeholders should be integrated with the ULIP system.[9]

[7] *Compendium of PM GatiShakti*
[8] *Invest India website.*
[9] *Unified Logistics Interface Platform (ULIP) portal*

Figure 7: Key components of ULIP platform



Integration with existing data sources of ministries



Data exchange with private players



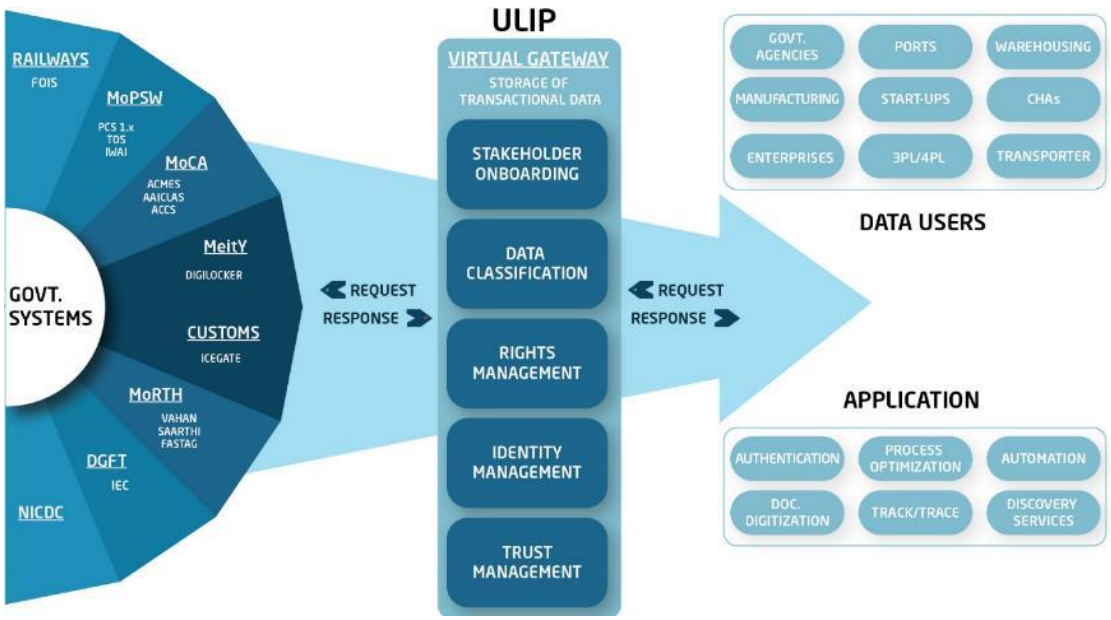
Unified document reference in the supply chain

ULIP has a dedicated portal that makes the process of data request simpler, faster, and transparent, and facilitates India's logistics sector with data-driven visibility and transparency. In line with the vision of PM GatiShakti, it has been conceptualised with the following objectives:

- To create a nationwide single-window logistics platform for end-to-end visibility
- To develop a logistics gateway by integrating information available with various government agencies across the value chain
- To provide visibility for the optimal usage of various transportation modes
- To provide data that can be utilised by stakeholders for the simplification of complicated processes such as compliance, document filing, certifications, and approvals
- To offer a platform for data exchange among government and private entities who are directly or indirectly involved in the Indian logistics ecosystem

Further, better technology has been adopted to strengthen the logistics sector. For example, paperless export-import trade operations have been made possible by the e-SANCHIT portal, and faceless evaluation in customs has been implemented. E-way bills and FASTag are also frequently used on roads to boost the effectiveness of the logistics industry. Moreover, a unified tax system such as Goods and Services Tax (GST) enables resolving issues related to the logistics sector.

Figure 8: ULP architecture



The following ministries/departments have integrated their systems with ULIP:

S. No.	Ministry/Department	Systems integrated with ULIP
1	Ministry of Ports, Shipping and Waterways	PCS, Terminal Operating System, Inland Waterways Authority of India
2	Ministry of Civil Aviation	Air Cargo Message Exchange System, AAI Cargo Logistics and Allied Services, Air Cargo Community System
3	Ministry of Road Transport and Highways	VAHAN, SARATHI, FASTag
4	Ministry of Commerce and Industry	Director General of Foreign Trade, PM GatiShakti
5	Ministry of Railway	Freight Operations Information System
6	Ministry of Finance	ICEGATE, E-Waybill
7	Ministry of Electronics and Information Technology (MeitY)	DigiLocker
8	National Industrial Corridor Development Corporation (NICDC)	Logistics Data Bank
9	Ministry of Consumer Affairs, Food and Public Distribution	Food Corporation of India[10]

Example of successful ULIP implementation under the Ministry of Road Transport and Highways[11]:

The implementation of the FASTag system for toll collection in India has been a resounding success with consistent growth in terms of toll collections for the government. On April 29 ,2023 , the daily toll collection through the FASTag system achieved a historic milestone, reaching an all-time high collection of Rs 193.15 crore, with 1.16 crore transactions recorded in a single day.

Since FASTag was mandated by the government in February 2021, the number of toll plazas under the FASTag programme has increased from 770 to 1,228, including 339 state toll plazas. With a penetration rate of around 97% and over 6.9 crore FASTags issued to users, the system has significantly improved the user experience by reducing the waiting times at NH Fee Plazas.

The consistent and progressive adoption of FASTag by highway users has not only enhanced the efficiency of toll operations, but also led to a more precise valuation of road assets, attracting further investment in India's highway infrastructure.

Coordinated infrastructure implementation across India for achieving optimal efficiency

In a country as large and diverse as India, where end-to-end delivery is a humongous task, multimodal transport is an effective solution. Overall, ~64% of India's freight is transported through road, and only 27% is through rail. The notion behind GSNMP is to introduce multimodal transport for freight movement in the country, to increase the modal share of rail, port and Inland Water Transport (IWT). Multimodal transport implies the movement of goods from point A to point B using at least two different modes of transport by a single transport operator. Right now, as freight transport is more inclined towards road transport instead of rail, Indian Railways has also targeted to increase its freight traffic to 3.3 billion tonne by 2030. [12]It is projected that the freight traffic will further increase after the commissioning of DFCs, which are expected to promote industrial activities and the development of new industrial hubs. NICDC under the Ministry of Commerce is implementing several projects along the corridor for the development of integrated industrial townships.

[10] *ULIP portal*
[11] *Press Information Bureau*
[12] *Improving rail efficiency and share in India's freight transport report -Niti Aayog*

Delhi, Mumbai, Chennai and Howrah are already linked through the existing Indian railway network. Connectivity between Delhi, Mumbai and Howrah will be further strengthened with the commissioning of the DFC project. The SagarMala Programme, which has a dedicated pillar of port connectivity projects, was launched to enhance connectivity between ports and domestic production/consumption centres.

There are 190 road and rail connectivity projects worth Rs 122 lakh crore identified to be implemented under the Sagarmala project, focusing on the connectivity of Major and Non-Major ports. Of these, 51 projects have been completed and 139 projects are in various stages of development and implementation. These projects are being implemented by the Ministry of Road, Transport and Highways, the Ministry of Railways, major ports and state agencies.

To further boost investment from the industry in the development of additional terminals for handling rail cargos, a new GCT policy was launched in December 2021. The locations for GCTs are being identified/finalised based on demand from the industry and potential cargo traffic. So far, 48 GCTs have already been commissioned and ~74 more locations have been provisionally identified for their development.[13]

Example of how coordinated infrastructure with PM GatiShakti is impacting/improving infrastructure in logistics:

Case study:

Strengthening the railway line between Bhadrak AND Vizianagaram

Project background and vision

Odisha is home to the country's second-largest coal reserves, with high demand abroad and in India across some Southern states. Rail alignment would reduce congestion in the existing burdened railway and port network, and ease freight movement. This will provide an alternate route for transporting coal and other minerals such as iron ore and steel from the ports to the domestic and global markets.

The PM GatiShakti edge and approach

At the time the project was initiated for enhanced connectivity, the Railway ministry was aware that the existing railway line was saturated. Two prominent challenges presented themselves, necessitating transportation to regions of high demand:

- Burgeoning congestion at the nearby Paradip port
- Surplus production at the coal mines and steel plants

When the current route from Paradip was unable to accommodate the augmented freight, the Railway ministry turned to GatiShakti with a definitive directive of establishing a third railway line within the corridor. The first-and-last-mile connectivity to these economic nodes was mapped on the NMP platform and the infrastructure planned by superimposing their alignment on the GIS maps. The approach maximises multimodality for seamless operations, creating a ripple effect with the industries and mines that use the materials transported. This helped in facilitating the multimodal movement from the goods sheds at Khurda, Jagannathpur and Srikakulam and provide raw material access to steel and power plants in Kalinganagar and Angul. It connects with other existing and planned infrastructure such as the upcoming East Coast Dedicated Freight Corridor between Kharagpur and Vijayawada, three ports of Gopalpur, Visakhapatnam, Gangavaram and airports in Bhubaneswar and Visakhapatnam, as well as five national highways. By combining smart planning and advanced technology, the Railway ministry used the GatiShakti approach to plan a game-changing railway route.

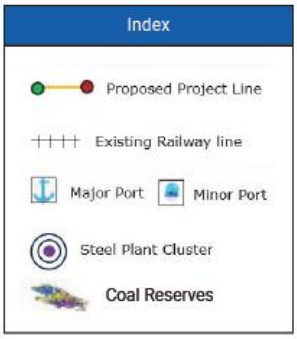
Illustration of the rail line between Bhadrak and Vizianagaram, highlighting the significant economic nodes it interconnects:

[13] *Press Information Bureau*



(Left): Project's Location

(Right): Project's Multimodality & Connectivity with Economic Nodes



Expected Impact:

The line between Bhadrak and Vizianagaram is expected to ease congestion on the Howrah-Chennai main line, which experiences heavy freight traffic due to the transportation of coal and other minerals to Paradeep, Dhamra, and Visakhapatnam. The line will benefit coal handling and export between the stretch of Paradeep Port and Talcher mines. With the two connecting ends having a triple line section, it will improve the utilisation of the existing rail network. The line is vital for the evacuation of cargo from upcoming ports like Bhavanpadu (now Mulapeta) and Astaranga. The line will also facilitate raw material movement from various ports to the steel plants in Kalinganagar as they expand. The project is expected to improve the transportation on the eastern coast comprising the Paradeep and Gopalpur ports, shifting the road-bound movement to rail. Additionally, the upcoming industrial base in Kalinganagar, Talcher coalfield, Balasore industrial area and major steel and iron ore industries near Paradeep will be at an advantage, as improved connectivity will reduce transportation costs and deliver goods faster, thereby making the ports more competitive in the global market.

Modal share impact on environmental sustainability

Road transport is more energy and CO_2 intensive, costly, and accident-prone, compared with other modes such as rail and water. India's current overuse of heavy trucks to move freight leads to high costs, air pollution and excess traffic deaths, especially if overloaded. [14]If aggravated, the issues pose a risk to the development of the logistics system.

The National Rail Plan aims to increase the modal share of rail to 45% of the logistics market by 2030-31 from ~27 percent, at present. Shifting of freight from road to rail is expected to bring down the logistics cost of gross domestic product (GDP) currently to a global average of 8% by 2030. Additionally, being more emission-efficient, railways have the least cost per tonne-km in the transport sector.

[14] *Fast tracking freight in India – Niti Aayog, RMI, and RMI India- June 2021*

Figure 9: These opportunities with the modal shift will also lead to the following benefits:[15]



Reduced logistics cost:

India has set a target of reducing the logistics costs as a share of GDP from 14 % currently to 10% by 2022, which can save up to INR 10 lakh crore



Reduced carbon emissions:

India can save 10 giga tonnes of CO2, 500 kilo tonnes of particulate matter and 15 million tonnes of nitrogen oxide caused by freight transport by 2050



Less truck traffic on roads:

Improved mode share and efficient logistics can reduce the vehicular-freight activity by 48% in 2050 over a BAU scenario

This new freight paradigm will also lead to higher economic growth, more employment opportunities, better public health and enhanced logistics productivity, which will meet many of India's development goals.

As discussed, the development of GatiShakti multimodal cargo terminals and DFCs, with a focus on proliferating the growth of railway cargo traffic, are steps in the right direction. Completion of the DFCs will also enhance the share of rail freight in the country from the current 30% to ~60% to 70% as in developed countries. They will also help decongest the road network and expected to save 450 million tonnes of CO_2 in the first 30 years of operations. [16]

The union ministry of ports, shipping and waterways (MoPSW)'s INR 5,000 crore package will facilitate the construction of vessels for inland waterways through the 'Make in India' initiative. Given that greenhouse gas footprint for a unit distance of cargo transported by waterways is almost half, compared with railways and about one-tenth, compared with road freight, the construction of vessels presents an opportunity to decarbonise the sector.

Inland cargo movement initiatives by corporates along NW-1

In Varanasi, a freight village is being developed along the Ganges to enhance the potential of Eastern DFC and to augment traffic capacity along the National Waterway 1 (NW-1). Inland waterways cargo movement has started from NW-1 by PepsiCo, Dabur, Emami and IFFCO from Kolkata to Varanasi, where a freight village is being developed to connect it to the eastern DFC.

Circling back to roads, the policy framework must be accompanied by a behavioural shift towards more sustainable modes of transportation. While awareness for transitioning towards greener modes is increasing, it is imperative to continue passenger-level incentivisation and the enabling policy environment.

[15] *Fast tracking freight in India - NITI AAYOG, RMI, AND RMI INDIA*
[16] *DFCCIL*



Green logistics: Journey towards sustainable horizons

Increasing globalisation of supply chain activities across industries is leading to highly complex logistics networks. With the dynamic landscape of India's evolving logistics sector, green logistics becomes a necessity. In this context, the section on understanding the essence of green logistics and its drivers becomes crucial. A balancing act, in collaboration with supply chain stakeholders, is required to restructure its network to reduce the ecological footprint and move towards green logistics. Green logistics can be defined as supply chain management practices and strategies that reduce environmental and energy footprint across various stages of the supply chain from procurement of raw material to finally delivering the end-product to the customer. [17]The table below shows prevalent logistics practices in different dimensions with their environmental impact:

Logistics Dimension	Logistics practice	Impact on environment
Flexibility	• Just in time strategy • Door-to-door delivery	Production, distribution and retailing models that consume more energy and generate more emissions
Time, speed, costs, reliability	• Physical distribution costs reduction • Speed and time differentiation • Service (time and product) reliability	• Increased dependence on most polluting and least energy efficient transportation mode • Neglect of environmental impact
Warehousing	Reduction in inventories and warehousing activities leading to in-transit inventories	Increase in congestion and pollution on roads

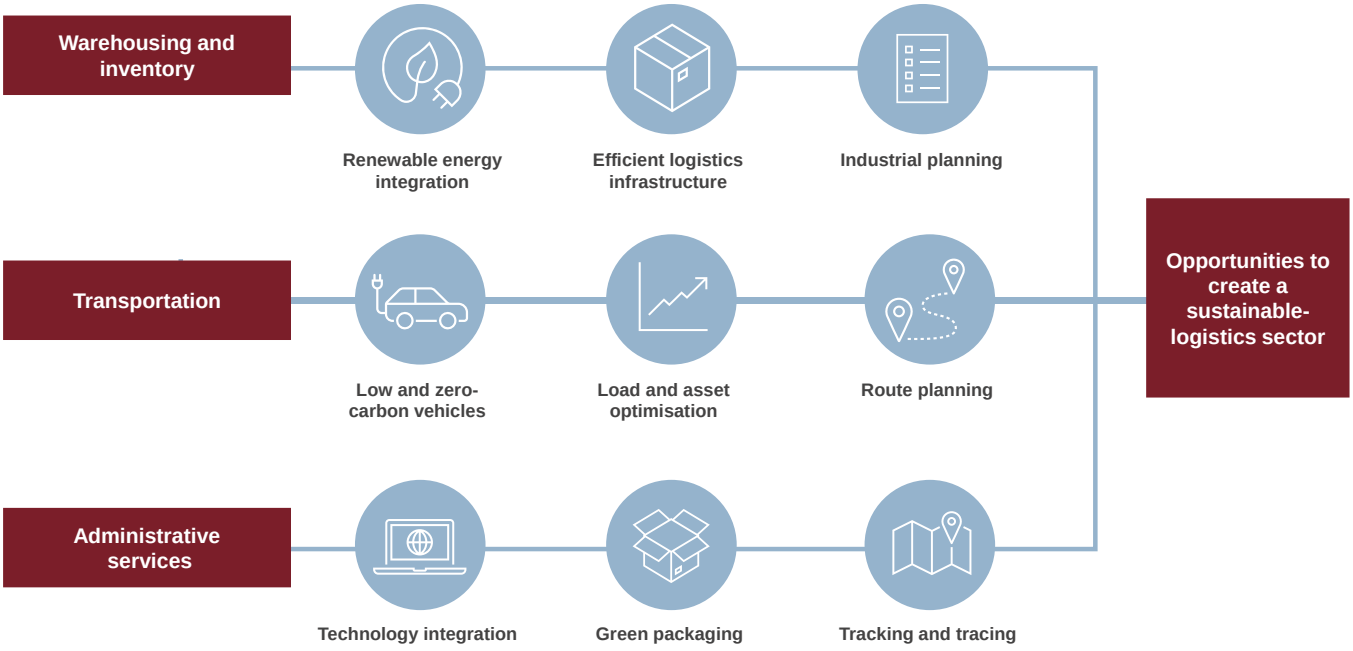
Source: Redesigning logistics for a better tomorrow report

[17] *Redesigning logistics for a better tomorrow -CII report*

Understanding the essence of green logistics and its drivers

Globalised economy, with a robust and flexible logistics system, can be a differentiating factor leading to the success or failure of business activities. Green logistics stands as a pivotal component in India's commitment to sustainable development goals within the realm of transportation and supply chain management. In response to heightened global concerns regarding climate change and ecological degradation, India is actively embracing opportunities under sustainable logistics strategies to reduce its overall carbon footprint and meaningfully move forward towards a more sustainable future.

Figure 10: Sustainable logistics practices and their impact



Programmes and initiatives in the NLP that proposes to directly address sustainable logistics sector:

Developing an accreditation of excellent green logistics enterprises and infrastructure
Developing a system of rating and recognition for logistics service providers
Coordinating between line ministries and agencies to promote the development of green innovation in infrastructure, including integration of green and sustainable principles within projects identified in the NLMP
Working with states to develop their master plans, including setting up schemes and programs to promote use of electric and green alternatives for urban logistics and last mile.
Developing a 'Green Logistics' Centre of Excellence in India

Source: National Logistics Policy and Green Freight Measures (SDGS UN Report)

Pillars of sustainable green logistics

The Indian warehousing and supply chain logistics sector is experiencing a growing inclination towards environmentally friendly practices, underscoring the significance of adopting green initiatives to minimise environmental impact. By incorporating such initiatives, warehouses and supply chains can gain various advantages, including energy savings, water conservation, reduced greenhouse gas emissions and improved productivity.

The pursuit of green logistics involves three key pillars:

Figure 11. Three pillars of Green Logistics



1. **Green Warehousing:** Implementing eco-friendly practices within warehouses to optimise energy usage, conserve water and enhance the overall efficiency. Warehouses can minimise their environmental impact and carbon emissions by embracing energy-saving practices[18]:

   Warehouse Management System (WMS): Efficient warehouse management is integral to mitigating redundant operations, leading to a notable reduction in energy and fuel consumption. Specifically, the optimisation of high-density areas, where an abundance of products is confined to limited spaces, can significantly minimise reliance on forklifts. Streamlining operations is imperative to curbing the multiple handling of products, thereby enhancing material flow—a critical factor in effective energy management. Employing advanced inventory tracking technologies, such as Radio Frequency Identification (RFID), serves to eliminate superfluous material handling activities, resulting in substantial savings on both energy and fuel fronts. The strategic implementation of vertical warehousing, encompassing racking and storage, coupled with the utilisation of vertical equipment like carousels and conveyors, enables companies to not only reduce land requirements, but also minimise construction footprints. This approach facilitates superior facility planning, culminating in heightened space utilisation and operational efficiency. In essence, the synergy between efficient warehouse management practices and the objectives of PM GatiShakti underscores the potential for a more sustainable, technology-driven and streamlined logistics ecosystem.

Case study: Kuehne + Nagel Green Warehouse

The Kuehne + Nagel Minworth facility near Birmingham was fitted with 250W and 400W high pressure sodium lamps, averaging about 280W and 430W of power, respectively. Since they were ineffective at night, the lamps required to be changed every 20,000 hours. As a solution, they were replaced with 150W LED lights that resulted in:

- Saving 555,735kWh energy worth £42,000 annually
- Reducing 270 tonnes of carbon
- Running for 60,000 hours

[18] *Redesigning logistics for a better tomorrow – CII report*

Efficient Lighting System: Optimising lighting systems within warehouses is paramount to curbing unnecessary energy consumption. Implementing motion sensors, particularly in low-traffic or non-crucial areas, ensures that lighting activates only when required. Additionally, the adoption of energy-efficient solutions, such as LED lights proves instrumental. It offers a substantial reduction of up to 90% in energy usage and an extended lifespan, thereby diminishing maintenance expenses.

Material Handling Equipment: The adoption of energy-efficient material handling equipment, such as battery-operated or fuel cell forklifts, resonates with the NLP's emphasis on environmentally friendly practices. Automation systems, triggered by sensors to optimise operations, are in harmony with the technology-centric vision of PM GatiShakti, contributing to streamlined and efficient logistics.

Temperature Control: Temperature control emerges as a pivotal facet, particularly in industries such as pharmaceuticals and agro-products where optimal warehouse temperature is important for product maintenance. Beyond enhancing product quality, maintaining an optimum temperature regime aids in regulating energy consumption. A mere 1-degree Celsius reduction in internal warehouse temperature can yield considerable energy saving. High-Volume, Low-Speed (HVLS) fans prove instrumental, allowing warehouses to adjust thermostat settings by three to five degrees without compromising temperature integrity, thereby realising substantial savings of 10% to 20% in heating and cooling costs.

Roof Insulation: Proper insulation reduces the need for excessive heating and cooling, resulting in enhanced energy efficiency. Upgrading wall insulation from traditional batt to loose-fill or sprayed foam can double energy efficiency, while replacing conventional black rubber roofing membranes with reflective alternatives such as white thermoplastic polyolefin roofing augments roofing system efficiency.

2. **Green Packaging:** Indian packaging market was valued at USD 50.5 billion in 2019 and is projected to reach USD 204.81 billion by 2025, [19] emphasising the use of environmentally sustainable packaging materials to reduce waste and contribute to environmentally conscious supply chains. Implementing sustainable packaging practices involves several key considerations such as:

Efficient Strategies for Waste Reduction: Encouraging manufacturers and suppliers to adopt strategies that reduce the sources of packaging waste is pivotal. This involves optimising product sizes and utilising minimal packaging materials without compromising on safety and integrity.

Promoting Reusability: Advocating for the use of returnable pallets and containers reduces the dependency on single-use packaging. Implementing an organised system for retrieving and reusing these containers through reverse logistics significantly elevates sustainability efforts.

Use of Innovative Biodegradables Material: Embracing cutting-edge biodegradable and compostable packaging materials, including bio-based plastics and natural fibre-based products, supports seamless breakdown. This fosters a circular economy and diminishes their presence in landfills.

Sustainable Cushioning and Wrapping Solutions: Exploring alternatives to traditional packaging materials, such as bubble wrap and foam peanuts, substantially reduces waste. Opting for eco-friendly choices like recycled paper and biodegradable air pillows minimises environmental impact while maintaining product safety.

[19] *Evolving landscape of warehousing and logistics in India*

Synergise green packaging across value chain: Collaboration among suppliers, distributors and retailers to optimise packaging throughout the supply chain will reduce or minimise waste through right-sizing packaging, eliminate unnecessary layers and enhance logistics efficiency. It will also quicken the implementation of sustainable materials.

The possible environmental benefits owing to usage of reusable packaging are:

Sharp reduction in solid waste: Shifting to reusable packaging will significantly cut solid waste as it does away with numerous single-use items. In fact, this will result in an impressive 86% reduction in landfill waste.[20]

Substantial decrease in CO2 emission: Reusable packaging solution removes the need for recycling or re-manufacturing, resulting in a substantial 60% decrease in CO2 emission. Also, reusable packaging requires up to 64% less energy for manufacturing compared with single-use alternatives and consumes up to 80% less water throughout its lifecycle vs. single-use options.

3. **Promotion of green transportation:** Adoption of environmentally friendly transportation modes needs to be encouraged to curb GHG emission and to create a more sustainable logistics ecosystem. In fact, integrating green transportation practices into the supply chain can curtail GHG emission and combat air pollution. Key initiatives and regulatory measures employed by India to foster sustainability within the transportation sector are:

Sustainable fleet management: Deployment of low-emission vehicles, particularly electric vehicles (EVs), has been identified as key in mitigating carbon footprint. Rising prevalence of EVs in warehousing and distribution minimises emissions across essential activities, such as pick-up, drop-off, loading and unloading.

Adopting of alternative fuels: The government, cognisant of the need for diversified fuel sources to reduce carbon emissions and promote eco-friendly transportation, has instituted emission standards, and is promoting alternative fuels such as ethanol blends (E-10 and E-20), flex fuels, and ethanol blend for diesel. Ethanol blending has emerged as a viable solution, significantly reducing emissions and being positioning as a greener fuel. Studies have shown that carbon monoxide emissions are 20% lower for E10 and up to 50% lower for E20 in two-wheelers, whereas hydrocarbon emissions reduce 20% in both blends.[21]

Incentivising EVs: To propel the adoption of EVs, the Ministry of Road Transport and Highways has issued advisories and notifications, as well as provided exemptions for permits to battery-operated and ethanol-fuelled transport vehicles. As per industry estimates in a year , just one electric car on the road can save an average of 1.5 million grams of CO_2.

FAME India scheme: The Ministry of Heavy Industries is spearheading Faster Adoption and Manufacturing of Electric Vehicles in India scheme in two phases. The ongoing Phase-2 focuses on reducing dependence on fossil fuels and providing a conducive environment for the electrification of public and shared transportation.

Mandatory fitness testing of vehicles: In tandem with sustainability efforts, the government has mandated fitness testing for motor vehicles through automated testing stations. This requirement extends to heavy goods vehicles, heavy and medium passenger motor vehicles, and light motor vehicles, and has specific timelines between testing to ensure compliance.

[20] *Evolving landscape of warehousing and logistics in India*
[21] *Niti Aayog – Roadmap for ethanol blending in India 2020-25*

Green financing

Green financing is a pivotal cog in the government's efforts to decarbonise the transportation sector and increase traction of adopting sustainable mobility. Green financing is to increase level of financial flows (from banking, micro-credit, insurance and investment) from the public, private and not-for-profit sectors to sustainable development priorities. A key component of this is to better manage environmental and social risks, increase opportunities that provide adequate rate of return and environmental benefits, and ensure greater accountability.

Figure 12 Approach for green financing



Public sector support



Financing mechanism



Microcredit for sustainable development

Between fiscals 2024 and 2030, investments in infrastructure projects are expected at Rs 46.0 trillion, an increase of 183% over fiscals 2017 and 2023.[22] Of this, green investments are projected at Rs 36.6 trillion, mostly towards the power sector. These investments will include development of power grids and distribution networks, installation of smart metering systems, and development of transport and hydrogen infrastructure.

Green bond issuances constitute only ~0.7 percent of the total bond issuances in India since 2018. It is expected that Indian companies will raise ~3.3 times the current level from green bonds and external commercial borrowings. The development of climate information architecture for batteries, modules and electrolysers will help in better classification systems for funds with the usage of uniform labels and taxonomies, reduce associated concentration risks, and mitigate greenwashing.

Hence, it is essential that conventional financing methods grow faster, and new financing avenues evolve.

Bonds and non-banks comprised bulk of green financing over fiscals 2017 and 2023. However, bonds and overseas issuances have moderated of late on account of higher interest rates globally. Also, of the aggregate green investments of Rs 36.6 trillion, only 23-25% is projected to be raised via domestic and international bond markets, including external commercial borrowings. Funding from these avenues remains a challenge and will require support in the form of policy interventions from the government and regulators and increasing market participation.

Government support needs to be accompanied by tax incentives for investment in green bonds. These tax incentives can take the shape of inclusion of green mobility funds for corporate social responsibility investments and coverage of additional issuance costs (green certification) for issuers. Additionally, guarantee structures and commitments signifying extension of term loans through interest waiver mechanisms or term relaxation measures will enable the development of robust viability assessment measures.

Thus, while sustainable mobility is rapidly gaining pace in India, the opportunities offered for green financing for sustainable transportation need to be capitalised upon. This requires forging new partnerships among government, academia and industry.

Global interventions for environmental-friendly logistics

It is critical to increase sustainability in logistics globally through a range of strategies aimed at minimising the environmental footprint of the transportation sector and the supply chain. Embracing cleaner energy sources, optimising transportation routes, and integrating innovative technologies are pivotal to these interventions.

[22] *Crisil Infrastructure Yearbook 2023*

As the world looks to address challenges of climate change and environmental degradation, examining successful case studies is imperative to identify and adopt practical approaches towards logistics solutions.

Case study: Advanced Clean Trucks Rule, California, USA

Medium- and heavy-duty trucks represent only 7% of California's vehicle fleet but contribute over 55% of particulate matter and 25% of GHG emission from all vehicles.[23] To promote the manufacturing and uptake of zero emission trucks (ZETs), the state has introduced Advanced Clean Trucks (ACT) rule, which is a supply-side policy that stipulates manufacturers must sell an increasing number of ZETs over time. The regulation outlines specific sales targets for three different truck classifications by 2035: 55% of new class 2b–3 (3.8–6.8 tonne) pick-up trucks and vans, 75% of class 4–8 (6.3 tonne and above) rigid trucks, and 40% of class 7–8 (11.7 tonne and above) tractor trucks.[24]

Desired impact: Enaction of ACT is expected to help California achieve its goal of 100% zero emission medium- and heavy-duty vehicle sales by 2045. Moreover, through this rule, the state will be able to avoid 17.3 million tonne of GHG emission between 2020 and 2040.[25]

Case study: Integrated Logistics Park at Jeddah Islamic Port, Saudi Arabia

Mawani (Saudi Ports Authority) and AP Moller Maersk (a global logistics and shipping company) have formed a strategic partnership to develop Saudi Arabia's integrated logistics park at Jeddah Islamic Port.[26] The $346 million park will cover 225,000 square metres. Within the park, 70% of the space will for warehouses and distribution centres, which will be equipped with state-of-the-art management systems and other technological and digital solutions to enhance inventory management, traceability and visibility of inventory flows. As part of a commitment to sustainability, all park operations will also be powered by renewable energy sources. Additionally, transportation within the park will be via electric trucks.

Desired impact: The park design will increase overall productivity by 50% and contribute to Maersk's target of achieving net-zero logistics operations by 2040.

Case study: Low-emissions zones, London, UK

London introduced low-emissions zones (LEZs) in 2008 to reduce exhaust emissions of older and more polluting vehicles and to promote the adoption of zero emission trucks (ZEVs). Under the scheme, vehicles are subject to incremental fees, based on compliance with European emissions performance standards. Success with LEZs led the city to impose stricter tailpipe emissions standards for cars, vans, specialist vehicles and minibuses entering the city through the creation of ultra-low emission zones (ULEZs) in 2019. As a result, more vehicles in London have begun to meet the latest European emissions performance standards (Euro 6).

Impact: Since its implementation, ULEZ has reduced nitric oxide emissions in central London by 50%. Building on this success, the ULEZ was expanded to all London boroughs on August 29, 2023. This will provide cleaner air to over 5 million people in the city. [27]

[23] *"California Ready to Take Giant Leap Toward Zero-Emission Trucks," Union of Concerned Scientists, April 19, 2023,*
[24] *"Advanced Clean Trucks Fact Sheet," California Air Resources Board, August 20, 2021*
[25] *Claire Buysse and Ben Sharpe, "California's Advanced Clean Trucks Regulation: Sales Requirements for Zero-Emission Heavy-Duty Trucks," International Council on Clean Transportation, July 2020*
[26] *"A.P. Moller — Maersk and Mawani Break Ground for Saudi Arabia's Largest Integrated Logistics Park at Jeddah Islamic Port," MAERSK, February 16, 2023*
[27] *"The Ultra Low Emission Zone (ULEX) for London," Mayor of London, London Assembly, June 16, 2023,*

Navigating future requirements and implementation challenges

Currently, there is lack of awareness and understanding of green logistics among businesses and consumers and green logistics faces challenges, such as high initial cost of investment and lack of infrastructure, the demand for green logistics is set to increase, as benefits of sustainability gains traction.

Application of modern technology such as internet of things, cloud computing, big data, digitalisation, and AI are increasingly becoming boosters for green logistics. Such technologies will enable logistic companies to implement green initiatives in more operations, including warehousing and distribution, and further reduce carbon emission while improving operating efficiency. These will also assist in delivery route planning and prioritise load pooling.

Data analysis can help organisations analyse their environmental impact as well.

Dependence on fossil fuels	•Logistics is heavily dependent on transport, which runs majorly on fossil fuels, causing massive carbon footprint. Adoption of EVs can minimise emissions in logistics, but it will for a substantial impact to be noticed
Lack of infrastructure	•Charging infrastructure for EVs is in development. There is a need to customise it to the unique Indian transport ecosystem and build capacity among stakeholders to support its on-ground expansion
Last-mile delivery impact	•E-commerce has increased the volume of delivery vehicles in cities and many times these vehicles are not optimally utilised. A vehicle not being utilised properly will take more trips for delivery, causing an increase in the carbon footprint

Future prospects

Consumer habits are changing rapidly, where demand is for high quality products, combined with rapid delivery. AI, blockchain, big data and digitalisation will be the driving forces for logistics. These technologies will help automate mundane tasks, thus improving efficiency in logistics, and could also help in the analysis of datasets and trends by identifying resource consumption, waste management, etc. The actual trajectory of green logistics will depend on such technological advancements, public attitude towards sustainability and regulatory developments.

Blockchain	Big data analytics	Cloud logistics
• Automation and efficiency • Physical and digital security	• Environmental sustainability • Enhanced customer experience	• Operational efficiency • Transportation and warehouse systems

PM GatiShakti and NLP paving way for green and efficient future

The logistics sector is growing rapidly across developing economies. This report provides an overview of sustainable logistics to address climate change, enhance livelihoods, improve public health and foster economic growth.

India's G20 presidency — focused on One Earth, One Family, One Future — was vital in galvanising the implementation of sustainable logistics practices across countries and businesses.

Making transportation, warehousing and inventory management, and packaging of goods and global supply chains which are gearing towards sustainability requires efficient operational practices, innovative policies, new and updated infrastructure, and investment.

Via PM GatiShakti, 48 GCTs have been commissioned to-date in India, with the private sector also participating. Already, 22 social sector ministries have been added to the digital platform by the Ministry of Commerce, enhancing their coverage to socio-economic development. Furthermore, integration of 39 infrastructure and user-friendly ministry portals, and that of 36 states and union territories, has been completed[28].

The NMP currently has 1,548 integrated data layers from the Centre and states. This has facilitated 85 large infrastructure projects totalling nearly Rs 5.4 lakh crore so far. The government is now working on a mechanism to make this data available to industries and potential investors. As a result, traction is building.

Also. with the success of GCTs, government departments are now reaching out to PM GatiShakti with more proposals, and the private sector is seeking more opportunities.

PM GatiShakti is enhancing the competitiveness of Indian industries as well. With current levels of logistics cost to GDP ranging from 7.8-8.9% for fiscal 2022 as highlighted in latest findings of 2023[29],showcases the collective impact of initiatives, schemes and transformative policies, which suggests that logistics costs can be further reduced from current levels.

To make sustainability part of the logistics sector, the report advocates for a comprehensive policy framework, covering green warehousing and green transportation, including targets, regulatory standards, subsidies and incentives, implemented across all levels of government.

Indeed, the strategic development of logistics infrastructure, encompassing storage facilities, transportation networks and EV charging stations, is crucial to streamline operations, reduce waste, and efficiently distribute goods.

Green financing is identified as a crucial driver for these initiatives. Despite the perceived high risk of logistics projects, collaboration among entities, including multilateral development institutions, government incentives and private sector capital, can mitigate risks and ensure successful project implementation.

Globally, communities and businesses are already embracing sustainable logistics models, providing valuable insights for India to leverage.

By championing sustainable practices outlined in the report, India stands to become a leader in mitigating climate change, improving livelihoods, fostering global economic growth, and be the conduit for inclusive collaboration.

[28] *Press information Bureau (ID: 1964364)*
[29] *Report on logistics cost in India – December 20, 2023*

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