

View Point

Multi-modal Logistics in India: An integrated role of Gati Shakti Vishwavidyalaya (GSV), Central University and PM Gati Shakti Master Plan

by

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Abstract

This article is a view point which intends to appreciate the key features of Gati Shakti Vishwavidyalaya (GSV) and its critical role in the success of PM Gati Shakti (PMGS) Master Plan. The article builds on the key issues involved in multi-modal logistics, role of GSV, Indian Railways (IR) as a key enabler and how this can appropriately be linked with PMGS. *The article proposes a futuristic academic portfolio of a University aiming to support the key objectives of PMGS.* The article raises critical questions for future research and investigation at both technology and policy levels.

Gati Shakti Vishwavidyalaya (GSV), Central University (formerly National Rail and Transportation Institute) is the first university in the domain of transportation established by Ministry of Railways, Government of India (GoI) with a mandate to support Multi-modal logistics through teaching, research, skilling and executive training.

Gati Shakti University (GSV) was granted the central status by the Union Cabinet in July 2022. The mandate of GSV is to enhance the competitiveness of the entire transport sector to support the ambitious growth and modernisation in the field.

GSV is created to provide skilled manpower and cutting edge solutions for the future need of transportation sector in India. The mandate of GSV includes all modes of transport and intends to develop cutting-edge technology and management solutions for the multi-modal transportation in India.

PM Gati Shakti was launched formally in October 2021 with an ambitious goal to develop “holistic infrastructure” by allocating a huge budget of Rs. One hundred lakh-crore for multi-modal transportation in India. It is designed as a National Master Plan for Multi-modal Connectivity, a digital platform to bring 16 Ministries, including Railways, Civil Aviation, MEITY, Shipping, and Road Transport, together for integrated planning and coordinated implementation of infrastructure connectivity projects. As per the Government of India, the Gati Shakti scheme is based on six pillars - comprehensiveness, prioritization, optimization, synchronization, analytical, and dynamics.” PM Gati Shakti to generate multiple employment opportunities cut down on logistics costs, improve supply chains and make local goods globally competitive”.

Logistics is used to refer to the process of organizing and transferring resources such as

- people,
- goods,
- inventories, and
- equipment
- from one place to the intended destination
- The word logistics originated in the army, referring to the delivery of equipment and supplies to field troops

India aims to reduce its logistics cost from present 14% to 8-9%. To achieve this ambitious goal of reducing logistics cost by 5-6%, India has put a significant emphasis on infrastructure development in the Union budget 2023-24 for enhancing the logistics efficiency in next decade. India has shown a significant improvement in Logistics Performance Index and Ease of Doing Business during last one decade. This is attributed to competitive government policies and focus on Make in India program.

Logistics efficiency significantly depends upon 12 verticals of logistics:

1. Warehousing (including tertiary packaging)
2. Land Transportation (including Commercial Vehicle Drivers for Cargo)
3. Cold Chain Solutions
4. Courier and Express Industry
5. E Commerce
6. Port Terminals, Inland Container Depots and Container Freight Stations
7. Air Cargo Handling (other than Tarmac side operations)
8. Freight Forwarding and Customs
9. Marine Services, Shipping and Inland Waterways
10. Supply Chain Solutions
11. Liquid Logistics
12. Rail Logistics

There are seven engines such as Railways, Waterways, Roads, Ports, Airports, Mass Transport and Logistics Infrastructure and six pillars of PM Gati Shakti – National Master Plan for Multi Modal connectivity which includes Comprehensiveness, Prioritization, Optimization, Synchronization, Analytical and Dynamic to achieve following goals:

- ✓ Reduction in Logistics Cost
- ✓ Reduction in Time Delays
- ✓ Providing gainful employments
- ✓ Bringing speed in the movements of Goods and Services

GSV and PM Gati Shakti Master Plan intends to revamp the efficiency of entire transport ecosystem in India by focusing on all the twelve verticals of logistics by creating an eco-system for multi-modal logistics. There are many positive happenings in the logistics sector in India.

- The logistics market in India is forecasted to grow at a CAGR of 10.5% in next decade.
- There is an increased investment in infrastructure, last-mile connectivity, and emerging technologies are streamlining the logistics landscape in India.
- Port capacity is expected to grow at a CAGR of 5% to 6% by 2022, thereby, adding a capacity of 275 to 325 MT.
- Indian Railways aims to increase its freight traffic from 1.1 billion tons in 2017 to 3.3 billion tons in 2030.
- Freight traffic on airports in India has the potential to reach 17 million tones by FY40.

It is interesting to note that India is currently a \$ 3.1 trillion economy. It took India 60 years since Independence to become one trillion-dollar economy, but the next trillion dollars was added only in 7 years. The 3rd trillion was added in just 5 years in 2019. There is a big challenge and opportunity to serve such a large and exponentially growing economy in the world. We are in the phase of harnessing optimal utilization of resources through a competitive infrastructure development which caters to the phenomenally growing need of transport across all the sectors in a highly efficient multi-modal transport system.

PM Gati Shakti - National Master Plan for Multi-modal Connectivity, essentially a digital platform to bring 16 Ministries including Railways and Roadways together for integrated planning and coordinated implementation of infrastructure connectivity projects. The ₹100 lakh crore (Rs 100 trillion) project is aimed at easier inter-connectivity between road, rail, air and waterways to reduce travel time and enhance industrial productivity. To realize this ambitious dream of multi-modal connectivity, there is a need to provide a pool of trained professionals in the transportation sector across all modes of transport and develop indigenous technology solutions for the transport sector. GSV has a strong mandate to contribute in this direction.

It is envisaged that the multi-modal connectivity will provide integrated and seamless connectivity for movement of people, goods and services from one mode of transport to another. It will facilitate the last mile connectivity of infrastructure and also reduce travel time for people.

PM Gati Shakti incorporates the infrastructure schemes of various Ministries and State Governments as summarized below.

Dedicated Freight Corridors (DFC):

First 2 DFCs, Western Dedicated Freight Corridor (WDFC), from Dadri in Uttar Pradesh to JNPT in Mumbai and Eastern Dedicated Freight Corridor (EDFC), Ludhiana in Punjab to Dankuni in West Bengal, aims to decongest railway network by moving 70% of India's goods train to these two corridors. It is both enabler and beneficiary of other key Government of India schemes, such as Industrial corridor, Make in India, Startup India, Standup India, Sagarmala, Bharatmala, UDAN-RCS, Digital India, BharatNet.

Bharatmala:

Envisages development of about 26,000 km length of Economic Corridors, which along with Golden Quadrilateral (GQ) and North-South and East-West (NS-EW) Corridors are expected to carry majority of the Freight Traffic on roads. Further, about 8,000 km of Inter Corridors and about 7,500 km of Feeder Routes have been identified for improving effectiveness of Economic Corridors.

Sagarmala:

Investment of ₹8.5 trillion to set up new mega ports, modernizing India's existing ports, developing of 14 Coastal Economic Zones (CEZs) and Coastal Economic Units, enhancing port connectivity via road, rail, multi-modal logistics parks, pipelines & waterways and promoting coastal community development, with the aim of boosting merchandise exports by US\$110 billion and generating around 10 million direct and indirect jobs. It intends to improve the utilization of India's 7,517 km long coastline, 14,500 km of potentially navigable waterways and its strategic location on key international maritime trade routes. Sagarmala aims to modernize India's Ports, so that port-led development can be augmented and coastlines can be developed to contribute to India's growth. The project aims to transform the existing Ports into modern world-class Ports and integrate the development of the Ports, the Industrial clusters and hinterland and efficient evacuation systems through road, rail, inland and coastal waterways resulting in Ports becoming the drivers of economic activity in coastal areas.

UDAN:

A regional airport development program of the Government of India and part of the Regional Connectivity Scheme (RCS) of upgrading under-serviced air routes with an aim to make air travel affordable and improve economic development in India. UDAN-RCS is both an enabler and a beneficiary of other key Government of India schemes, such as Bharatmala, Sagarmala, Dedicated Freight Corridors, Industrial corridor, BharatNet, Digital India and Make in India, National e-Governance Plan, Startup India and Standup India. The project intends to connect an unspecified number of new regional routes, by operationalizing 100 regional airports.

In addition to the above, Government of India has allocated significant budget for the infrastructural development projects like inland waterways, dry/land ports, Economic Zones like textile clusters, pharmaceutical clusters, defence corridors, electronic parks, industrial corridors, fishing clusters, agri zones to improve connectivity and make Indian businesses more competitive. The success of PMGS – Multi-modal connectivity intends to leverage the technology extensively including spatial planning tools with ISRO (Indian Space Research Organisation) imagery developed by BiSAG-N (Bhaskaracharya National Institute for Space Applications and Geoinformatics).

To realize the success of PMGS, it is expected that academic curriculum accommodates the key focus areas of PMGS and it must be designed in-line with the six pillars of PM Gati Shakti Master plan to create the pool of skilled professionals who can effectively contribute and improve the efficiency of logistics and transportation sector in India.

Transportation and Logistics Sector is multi-attribute in nature and hence demands a highly interdisciplinary approach to deliver the professionals and solutions relevant to the context of India's emerging needs under PMGS. It is expected that the academic programs need to be designed including following as the core spirit of its academic portfolio.

- An increasing focus on interdisciplinary teaching and research
- An enhanced importance on large scale problems, rather than techniques
- Greater emphasis on collaborative work

PMGS is based on six pillars. A mapping of six pillars of PMGS for an expected enrichment in the academic portfolio is presented as below.

Pillars of PM Gati Shakti (PMGS) National Master Plan	Objectives of the Pillar	What an academic portfolio of a University should include to meet the expectations of PMGS?
Comprehensiveness	Aims to improve visibility across all the department by sharing critical data during planning and execution of projects in a comprehensive manner.	IT platforms for transparency and data sharing
Prioritization	Expects the ministries and departments to prioritize their projects through cross-sectoral interactions.	Multi-modal Transportation
Optimization	Intends to generate optimal solutions for selecting the most optimum route in terms of time and cost. Technological upgradations of the engineering systems in the various modes of transport.	Artificial Intelligence, Machine Learning, Operations Research and Simulation (including Digital Twins) based optimization for multi-modal transport design, planning and monitoring.
Synchronization	Intends to improve coordination and synchronization in planning and implementation of the project across Ministries and Departments to minimize delays.	Information Technology based synchronization of activities. Policy development and deployment for coordinated governance.
Analytical	It will provide the entire data at one place with GIS based spatial planning and analytical tools having 200+ layers, enabling better visibility to the executing agency.	Use of geo-Informatics and geospatial technologies in transportation for planning, coordination and real-time tracking.
Dynamic	All Ministries and Departments will now be able to visualize, review and monitor the progress of cross-sectoral projects, through the GIS platform, as the satellite imagery will give on-ground progress periodically and progress of the projects will be updated on a regular basis on the portal.	Geographic Information System (GIS) and Remote Sensing (RS) for specialized capabilities for managing location-based information, manipulating, analysing, and visualizing the captured images.

An academic portfolio of a University designed in-line with the vision and objectives of PMGS should adequately accommodate the following three important attributes at macro level.

1. Integration of all modes of transport for Multi-modal transportation.
2. Systemic Perspective - ensuring integration of technology, people, processes, management and sociological aspects.
3. Aligning academic portfolio of University with integration of Ministries taking place as a part of Gati Shakti National Master Plan.

The micro-level objectives of the University aiming to deliver the expected outcomes for PMGS should have a diverse academic portfolio including Schools, Centre of Excellence (CoE) and Vocation Programs focusing on following key aspects:

- Augmenting the capacity of the existing transport network through multi-modal transport
- Optimization of the distribution of traffic flows in the network in time and space
- Providing travel priorities for a certain type of transport
- Transport management in the event of accidents, catastrophes or measures that affect the movement of transport
- Improving road and rail safety, which leads to an increase in traffic capacity
- Reducing the negative environmental impact of transport
- Provision of information on the state of the all modes of the transportations to all interested parties.

Objectives of Schools:

- Offer academic programs in-line with the PM Gati Shakti National Master Plan.
- Offer cutting-edge industry relevant academic programs at Undergraduate and Postgraduate levels to create skilled professionals for the transport and logistics sector in India.

Objectives of Centre of Excellences (CoEs):

- Provide contextualized solutions to strengthen Government systems and other public/ private systems.
- Develop and pilot/implement innovative solutions to maximize the utilization of logistics and transportation systems in India.
- Facilitate and promote start-ups and Entrepreneurship.

Objectives of Vocational/ Skill Building Diploma/ Certificate Programs:

- Build, enhance and upgrade capacities of stakeholders through cross learning, trainings, webinars and workshops.

It is important to appreciate the role of Indian Railways (IR) as an efficient logistics provider in enhancing the multi-modal connectivity in India. IR is the fourth largest national railway system in the world by size with a glorious history of more than 160 years (started in 1853). It has a total route length of 68,103 km (42,317 mi). 52,247 km (32,465 mi) or 83% of all the broad-gauge routes are electrified with 25 kV 50 Hz AC electric traction.

IR is a perfect example of both traditional and modern system. It has set an exemplary case of a sustainable organization which has survived, progressed and served unstopable since more than 150 years. Indian Railway offers opportunities for research in all the domains of engineering, management, technology and policy planning. This broader and holistic scope has always attracted the scholars from various facets and provided purely an interdisciplinary platform for an integrated, inclusive and holistic research.

The scope of Indian Railways is attributed to three key dimensions:

- **Resilient** (for example, it has run India's longest train Sheshnag – 2.8 km, Oxygen express, RORO Trains etc. during Covid)
- **Flexible** (for example, it has coordinated the movement of lakhs of labourers by running Shramik Special trains during Covid)
- **Adaptable** (for example, provided isolation coaches, manufactured Personal Protective Equipment (PPE) kits during covid-19)

IR has received special emphasis in the Union budget 2023-24. The Indian Railways has been allocated a capital outlay of Rs 2.4 lakh crore in the Union Budget 2023-24. This is the highest ever allocation to the national transporter and continues on the trend followed last year with a gross budgetary support of Rs 1.37 lakh crore in fiscal 2022-23. It is estimated that there is a need to lay 1 lakh kilometres of tracks (including doubling of existing ones) over the coming 25 years as more goods movement shifts away from roads to railways.

Indian Railway is witnessing significant improvement in the competitiveness of its infrastructural assets. For example,

- A dedicated Freight Corridor (DFC) is a high-capacity railway corridor that is exclusively meant for the transportation of goods and commodities. With seamless integration of world-class technology, DFC ensures faster transit, reduced logistics costs, higher energy efficiency and environment-friendly operations. Rs 27,482 crore to the Dedicated Freight Corridor Corporation of India (DFCC) for the financial year 2023-24 (FY24), which is 75 percent higher than the Rs 15,710.44 crore allocated for FY23.
- Redeveloping 1,275 railway stations across the country under the Amrit Bharat scheme.
- Running 400 new-generation Vande Bharat Express trains in coming 2 years will transform Indian Railways.
- Indian Railways has set a target to achieve Net Zero Carbon Emitter by 2030. It has planned to reduce its carbon footprint and dependence on imported fuel thereby saving precious foreign exchange.

Union budget 2023-24 indicates infrastructure as one of the Saptrishi (7 Priorities of the union budget 2023). The Budget has rightly focused on ramping up infrastructure creation to provide a boost to revive economic growth. The new outlay of 10 Lakh Crore of infrastructure will aid in the development of the country. There will be 100 new projects for Last Mile connectivity for ports, coal, steel, fertilizers sector. To spur investment in infra at states 50-year interest free loan also continues.

It is important to appreciate the modes of transport in-terms of challenges involved and costs associated. Indian Railway being the bulk and eco-friendly service provider has a tremendous potential to offer cost effective transport solutions as a part of multi-modal logistics in India. It has undertaken mega projects to enhance its line capacity and meet this exponentially growing need of logistics sector which is catering \$3.1 trillion economy of India.

It is essential to understand that IR with majority of the entry barrier overcome in last few decades can leverage its line capacity to the fullest by adopting advanced technologies like IoT, Data integration and management systems etc. and increase its speed for both freight and passenger segment.

Rail network is not only characterized by its size by most importantly uniformity and quality compared to road network. Inconsistency in transport network is attributed to damages, losses and delays which are significantly controlled by Railways with advanced wagon technology – aluminium light weight – non-corrosive wagons and sound signalling and networking systems.

At present, in India, we primarily operate with inter-modal transportation where ownership keeps changing leading to damages, delays and increase in cost. We are aiming for multi-modal transportation with advanced multi-modal logistics parks (about 35) which provides single receipt management of entire consignment from one-end to other through an appropriate integration of multiple mode of

transports. Multi-modal transport where Railways has a critical role to play would significantly improve transparency, reduce lead-time and help to overcome demand-forecast issues in the supply chain.

It is important to appreciate the difference between “inter-modal logistics” and “multi-modal logistics”. Intermodal ensures the movement of cargo from origin to destination by several modes of transport where each of these modes have a different transport carrier responsible, each with its own independent contract. There are multiple carriers during a single journey of the shipment. The Shipper will have several contracts, one with each transport carrier to handle their specific leg of the shipment. Multimodal aims to provide the movement of cargo from origin to destination by several modes of transport where each of these modes have a different transport carrier responsible. However, this is ensured under a single contract or bill of lading. It is about single carrier during a single journey i.e. the same transport carrier is responsible for moving the shipment in all legs, in all modes - with one transport bill of lading.

There is a need to move the focus from competitive attitude to cooperative attitude to collaborative attitude where various modes of transport - Rail, Road, Water, and Air will create help to reduce logistics cost significantly through multi-modal transport network.

A futuristic academic portfolio of a University aspiring to enhance the implementation of PMGS may consider the key focus areas as indicated below.

Futuristic Academic Portfolio of University for PMGS

Schools [UG & PG level Academic Programs]	
Transport Engineering and Applied Science	B.Tech. (Transport and Mechanical Engineering) B.Tech. (Transport and Civil Infrastructure Engineering) B.Tech. (Transport and Electrical Engineering) B.Tech. (Transport Systems and Communication Engineering) B.Tech. (AI and Data Science) M.Tech. (Intelligent Transport Systems) M.Tech. (Railway Vehicle Engineering) M.Tech. (Geo-informatics and Transportation Systems) M.Tech. (Highway and Road Engineering) M.Tech. (Marine Engineering & Management) M.Tech. (Naval Architecture and Ocean Engineering) M.Tech. (Traffic and Transport Engineering) M.Tech. (Transport Information Systems and Cyber Security) M.Tech. (Geotechnical and Transport Engineering) M.Tech. (Transport Infrastructure Engineering and Management) M.Tech. (Transport Information Systems and Cyber Security) M.Tech. (Transport Energy and Environmental Engineering) M.Tech. (Railway Systems Engineering and Integration) M.Tech. (Artificial Intelligence and Information Systems) M.Tech. (Transport Technology and Policy) M.Tech. (Transport and Environmental Planning) M.Tech. (Renewable Energy Systems for Transportation)
Transport Management and Planning	MBA (Logistics and Supply Chain Management) MBA (Multi-modal Transportation Planning and Management)

Centre of Excellence (CoE)	
CoE 1	Multi-modal Transport Planning & Design
CoE 2	Transport Modelling, Analytics and Simulation (including Digital Twins)
CoE 3	Transport Safety, Reliability and Cyber Security
CoE 4	Design, Development and Innovations in Railway Technology (Propulsion and Traction Technologies)
CoE 5	Electric Vehicles, Batteries and Future Mobility
CoE 6	Automation in Logistics and Transportation
CoE 7	Sustainable and Inclusive Transportation
CoE 8	Innovation and Entrepreneurship in Transportation
Vocational Education	
This can be offered as:	
Diploma <i>or</i> Postgraduate Diploma Programs (2 years)	
Certificate Programs (1 year or 6 months)	
<ol style="list-style-type: none"> 1. Railway control and operations simulation 2. Railway network capacity and system analysis 3. Railway operations, rolling stock and technology 4. Railway risk and safety management 5. Transport operations and technologies 6. Track Engineering 7. Air Cargo Handling and Management 8. High-Speed and Intercity Rail: Planning & Design 9. High-Speed and Intercity Rail Operations/Engineering 10. Commercial Aspects of Transportation and Logistics Industry 11. Transportation Emergency Management 12. Transportation Security Management 13. Transportation Safety and Compliance Management 14. Digital Innovation & Technology in Supply Chain Management 15. Agri Food Supply Chain Management 16. Transportation Policy and Regulation 17. Transportation Planning and Project Development 18. Digital Supply Chain 19. E-Commerce Supply Chain 20. Healthcare Supply chain 21. Innovations in Supply Chain 22. Logistics Regulations And Compliance 23. Port Management 24. EHS (Environment, Health & Safety) Aspects and Codes of Safety & Security at Terminals (viz. CTPAT) 25. Retail Supply Chain Management 26. Multimodal Transportation Systems 27. Transportation and Shipping Logistics Management 28. Warehouse Management & Automation 29. Transportation Systems & Network Design 30. Sustainable Supply Chain 31. EXIM Policies (including Freight Forwarder & NVOCC Operator, Role of Customs, DGFT, RBI and PGA (Participating Govt. Agency), ICEGATE Operations, Export Incentives, Duty Deferment Schemes) 32. International Transport and Logistics 33. Transportation and Mathematical Modelling 34. Transportation, Trade Law and Policy 35. Asset management of Transport Infrastructure 36. IoT based condition monitoring and sensing 37. Hyperloop Technology 	

Before I conclude a view point on “**Multi-modal Logistics in India: An integrated role of GSV and PMGS**” in enhancing logistics efficiency in India, it is vital to indicate critical areas to be addressed by the researchers and policy makers to leverage the present strengths, resources and infrastructural capabilities towards multi-modal transportation in India. This includes:

1. Should we adopt top-down approach or bottom-up (customer centric) approach in the infrastructure development?
2. What are the reasons that there is a lack of interest of private parties in the development of logistics part? Is there an adequate incentivization and revenue sharing? *or* Is it the complexity at policy and contract level which is much higher?
3. How can we improve aggregation across supply chain and reduce transshipment points (loading and unloading processes) by synchronizing the existing infrastructure of various modes of transport (in-terms of its location) and the distribution network of the industries like automobile, steel etc?
4. How can we improve the rail share in the industry segments like automobile, steel and cement where rail can provide a much better transport option in-terms of cost effectiveness and bulk movement compared to road?
5. What are the policy and operational measures necessary to improve the infrastructural competitiveness of hinterland transport terminals/ ports and hence its connectivity with the existing rail network?
6. What are the next decade skills and technological solutions required with the advancements in the domain of mobility like electric vehicles, hydrogen fuel, autonomous vehicles, 5G enabled IoT solutions etc.? What is the critical role of GSV in fulfilling this emerging requirements?

WELCOME

to

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