Capacity Building to promote PM GATI SHAKTI Scheme with the Integration of Geoinformatics and Geospatial Technologies on Logistics and Supply Chain Management

Introduction:

The main aim of this report is to integrate Geoinformatics and Geospatial technologies in PM Gati Shakti capacity building on logistics and align it with the requirements of NEP 2020. As per the mandate of the PM Gati Shakti Scheme, premier academic institutions will be providing training on various facets of PM Gati Shakti for their students and the workforce already in place. The National Institute of Industrial Engineering [NITIE] is designated as the nodal hub for capacity building in Logistics and Supply Chain Management to promote the PM Gati Shakti Master plan by the Ministry of Education (MoE). They will be working closely with BISAG-N to implement the capacity-building exercise.

The broad areas of work: BISAG-N

The focus of PM Gati Shakti mission is to leverage technology, including spatial planning tools with ISRO imagery developed by BISAG-N (Bhaskaracharya National Institute for Space Applications and Geoinformatics) extensively. BISAG N works on three main domain areas: Satellite Communication, Geo-informatics, and Geo-spatial technology. BISAG-N uses Geoinformatics and the application of Geo-Spatial and emerging technologies for the integrated management of Multimodal transport. BISAG-N prepares Geospatial information to provide the necessary inputs to the government to assess and mitigate damage in the event of a disaster. It also works on satellite communication and remote sensing applications: inventory mapping, developmental planning, and monitoring of natural and man-made resources, including infrastructure projects. NITIE and BISAG-N can work together for a holistic approach, which can lead to integrated infrastructure development.

Incorporation of Geoinformatics and Geospatial technologies in various courses designed:

The courses that NITIE and AICTE design will be leveraging the IT platform of PM Gati Shakti developed by BISAG-N to provide experiential learning to the students as well as provide data for conducting case studies and research. This can lead to providing innovative solutions to industry, cities, and other stakeholders.

Geoinformatics and Geospatial technologies can be integrated across various logistics and supply chain management courses. Let us consider as an example of how it can be incorporated into the Agri-food supply chain courses. India has an agrarian-based economy. Geospatial technology is a rapidly developing area and can help optimize the agri-food supply chain and minimize logistics costs. Integrating various enabling technologies, such as Geospatial technologies, Geo-informatics, etc., have immense potential to transform the agri-food supply chain domain. These technology's applications can have significant social and national relevance in India's future growth.

These technologies can be used to design an effective logistics network. Geoinformatics and Geospatial technology are extremely useful in exploring potential warehouse locations with the lowest possible risk. With the availability of accurate geographical information, infrastructural development can be planned and executed very efficiently. Real-time tracking of vehicles on roads, railways, waterways, and airways will certainly lead to a manifold increase in efficient and effective transportation. It would also be beneficial in mitigating transportation risk by rerouting optimally using real-time geospatial information.

In Port Management, Geoinformatics and Geospatial technology applications would lead to efficient planning, coordination, and execution. For example, before even commencing the infrastructure building for a port, it is much easier to anticipate any geographical risks that may arise during the building phase. It can also help in clearing many approvals from various departments through real-time data sharing. Real-time tracking of vessels, containers responsive routing, scheduling, and robust planning can be very effective in the execution phase.

Among the different Geospatial technologies such as Geographic Position System (GPS), Geographic Information System (GIS), and Remote Sensing (RS), GPS plays a considerable role in improving the visibility of logistics operations of both middle-mile, last-mile delivery, and hyperlocal delivery. In the case of hyper-local delivery, customers are provided with the GPS interface showing the real-time position of the delivery person and expected delivery time based on the distance to be covered. This is particularly applicable for food and grocery delivery applications. For the last-mile delivery, GPS application can enhance the route planning to fit the maximum number of deliveries in the shortest possible time. Further, it can be used for facility location decisions (e.g., fulfilment centers) of e-marketplaces.

GPS adds immense value to the pharmaceutical or drug supply chain due to the cold chain requirements. It improves the supply chain visibility of a drug supply chain and helps make effective interventions in case of an unanticipated or unusual scenario. Similarly, in the blood supply chain, GIS-based applications are used to visualize an optimized transportation plan that helps deal with emergencies.

Research, projects, and internships using BISAG-N Platform

Many research projects can be undertaken in logistics using Geospatial and Geoinformatics. An example of research is the integrated approach combining procedures based on Geographical Information System and Multi-Criteria Analysis (GIS-MCA) developed to tackle the logistics of biomass-to-electricity in Apulia, Basilicata, and Campania in Southern Italy. The spatial availability of straw (from durum wheat) and tree-pruning (from olive grove and vineyard) was assessed. Several appropriate locations were detected by applying a set of land suitability criteria. Alternative scenarios with an increasing number of biomass plants were developed where optimal plant locations were found for each scenario by minimizing the total transportation distance. Logistics costs and the corresponding life cycle GHG (greenhouse gas) missions were estimated for each selected biomass plant.

Integration of NEP 2020 into the PM Gati Shakti scheme:

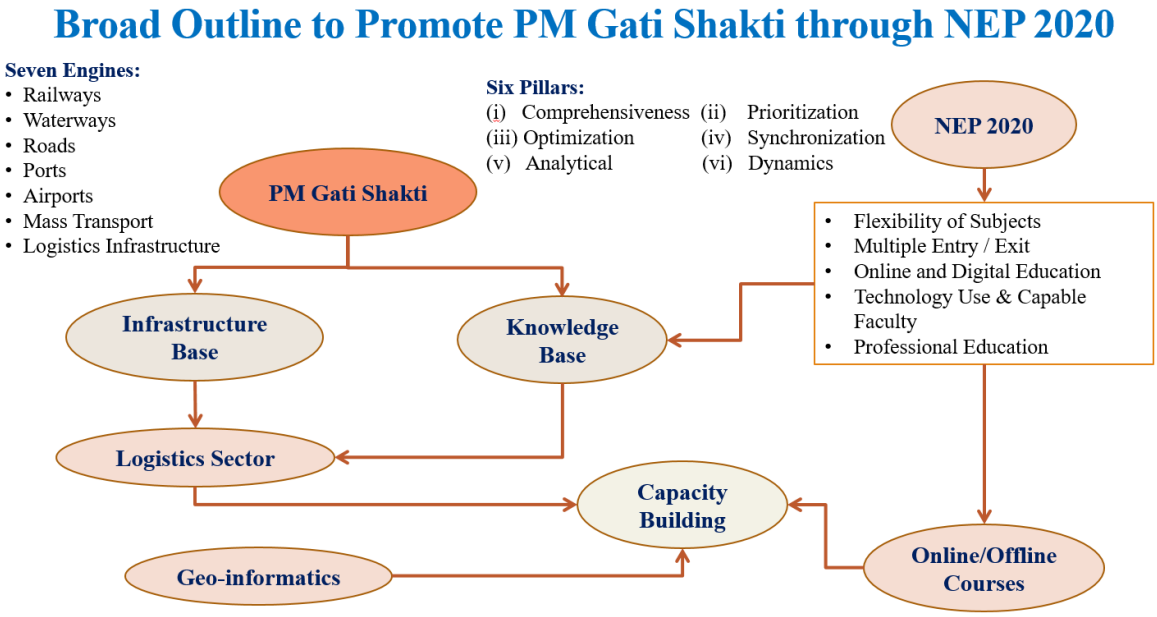
Many of the requirements of the NEP 2020 can be achieved through the PM Gati shakti scheme. This includes creating a credit bank for students through a collaborative initiative between the various institutes so that credits can be transferred. **NEP focuses on online and digital education. The courses on logistics and Supply chain designed by premium institutions will also be offered online: ODL ensuring greater reach for which the expertise of BISAG-N can be taken.**

As per clause 20.3. of NEP 2020, Agricultural education with allied disciplines will be revived. Both capacity and quality of agriculture and allied disciplines must be improved to increase agricultural productivity through better-skilled graduates and technicians, innovative research, and market-based extension linked to technologies and practices. **The GIS and Geospatial technologies in the supply chain tracking of agriculture goods and including this in the capacity-building programmes will go a long way. Innovative Research using Geo spatial and Geo informatics can lead to greater efficiencies in future.**

The NEP 2020 speaks about the preparation of professionals in agriculture and veterinary sciences through programmes integrated with general education will be increased sharply. The design of agricultural education will shift towards developing professionals who can understand and use local knowledge, traditional knowledge, and emerging technologies. GIS and Geospatial technologies in supply chains are typical examples of this. It is crucial in critical issues such as declining land productivity, climate change, food sufficiency for our growing population, etc.

Clause 20.6. on technical education includes degree and diploma programmes in engineering, technology, management, architecture, town planning, pharmacy, hotel management, catering technology, etc., which are critical to India's overall development. There will not only be greater demand for well-qualified manpower in these sectors but also require closer collaborations between industry and higher education institutions to drive innovation and research in these fields.**PM Gati Shakti scheme also focuses on collaboration between academia and industry**. Furthermore, the influence of technology on human endeavours is expected to erode the silos between technical education and other

disciplines. The integration of NEP 2020 into the seven engines and six pillars of PM Gati Shakti scheme is illustrated in the figure below.



Way forward for Achieving the Goal of training of 75,000:

The Process for achieving the goal of training 750000 will be achieved through collaborative efforts. NITIE has already designed 15 courses on the theme of the PM Gati Shakti Mission, they have also been uploaded on the NITIE Website for dissemination of this knowledge to all. Each of the participating Older IITs will be requested to train 3000 candidates inclusive of students and professionals on the courses as per their strengths. Each selected IIM will be requested to train 500 candidates inclusive of students and professionals. Each of the participating older NIT will be requested to train 1000 candidates inclusive of students and professionals. CEP Programmes can also be conducted under this umbrella. Each New participating NIT will be requested to train 500 candidates inclusive of students and professionals. The list of courses designed by NITIE and courses with GIS and Geo spatial technologies incorporated are given in **annexure -1**

AICTE has selected 10 main courses from the courses designed to run through FDP programmes. NITTTR will be requested to train 2000 through FDP programmes for various Teachers. Programmes can also be offered through MOOCs and Swayam Platform. NITIE

has been conducting various programmes with Professors of global repute on Logistics and Supply chain management where we get huge participation.

Conclusion:

The main benefit of capacity building is close collaboration between premium Academy institutions, the practitioners/industries, and the developers of the IT platform in the entire gamut of supply chain management space. This will ensure that all value chain stakeholders will be trained through this massive collaborative exercise. The application of Geo informatics, Geo spatial and other emerging technologies in this capacity enhancement exercise can lead to a reduction in logistics costs and a decrease in time and integrated Infrastructure Development. This capacity building will also help in meeting the requirements of NEP especially in the domain of Professional education in India.

Annexure – 1

The List of Courses Designed to be offered by the Institutes to promote PM Gati Shakti Scheme

1. Air Cargo Logistics Management
2. Digital Innovations & Technology in Supply Chain Management
3. Warehouse Automation
4. Agri-Food Supply Chain Management
5. Port Management
6. Transportation Systems and Network Design
7. E-Commerce Supply Chain
8. Healthcare Supply Chain
9. Humanitarian Logistics
10. Shipping Logistics Management
11. Multimodal Transportation
12. Sustainable Supply Chain
13. Retail Supply Chain Management
14. Supply Chain Finance

Geo spatial technology and its application in Logistics & Supply Chain

S.NO	Name of the Course	Application of Geo-Informatics and Geo Spatial Technologies
1.	Air Cargo Logistics Management	Information technology and GIS for managing air cargo operations Applications of Geospatial Technologies in Air Cargo Handling and Management Sustainable Intermodal Freight Transportation Optimizing Periodic Maintenance Operations
2.	Digital Innovations & Technology in Supply Chain Management	Applications of Geo-Informatics and Geo-Spatial Technologies for Supply Chain Management Application of Geospatial technology and GIS for cybersecurity supply chain
3.	Warehouse Automation	Use of Geo-spatial technology in Warehousing – like Global positioning systems (GPS), Remote sensing (RS).
4.	Agri-Food Supply Chain Management	Use of Geospatial technologies in enabling end-to-end agri-based supply chain.
5.	Port Management	Applications of geo-informatics and geo-spatial technology for efficient planning, coordination, and execution. Real-time tracking of vessels, responsive routing, and scheduling along with robust planning can be effectively made.
6.	Transportation Systems & Network Design	Finding potential locations for various infrastructures. Real-time tracking of vehicles on roads, railways, waterways, etc. Mitigating transportation risk by rerouting in an optimal way using real-time geospatial information.
7.	E-commerce Supply Chain	Last mile e-commerce delivery and route planning using GPS. GIS for facility location of e-commerce facilities.
8.	Healthcare supply chain	Cold chain visibility using GPS GIS and blood supply chain

9.	Humanitarian Logistics	**Cartography and Humanitarian Intelligence:** Rapid Assessment, Presentation of information, visualization, land use, infrastructure and facility mapping, remote sensing for monitoring and evaluation. **Crisis Simulation and Impact Models:** Analyzing what if scenarios and consequences of disaster, incident modeling, forecasting. **Risk Assessment:** Identification of "hot spots," combination of vulnerability and hazard assessment to evaluate at risk populations. **Vulnerability Assessment:** The integration of socio-economic and environmental data to serve as an early warning alert. **Decision making support:** Network and location analysis for resource allocation and optimization.