

# LOGISTICS: Current trends and future growth in warehousing, packaging and port handling.

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## ABSTRACT

*Logistics and Supply Chain is a key element for the functioning of any business, and it is fragmented into various segments. Warehousing, Transportation and Packaging are some of the important segments, which contribute majorly in storing, transporting and delivery of goods. In the constantly changing business dynamics, India seems to be a promising market with unlimited potential for growth in the logistics sector. The logistics sector in India has been a sluggish market due to stringent government norms and policies. Changing government policies on taxation and regulation of the service providers are going to play an important role in the process. However, multiple reforms introduced by government of India for a favourable change in the Supply Chain Industry. One of the Indian government's ambitious projects called as the 'Sagarmala Project' is a game changer when it comes to the role played by various ports in boosting the inbound and outbound logistics. In this Paper, we provide changes in the logistics and supply chain of every business, complex factors which help in setting the trends in warehousing, transportation and packaging. This paper also discusses a case study which focuses on optimising the export and import of products, by modernising the existing ports of India so that they match global standards.*

**Keywords Automation, Logistics, Packaging, SCM, Transportation, Warehousing.**

## I. INTRODUCTION

Logistics plays a major role in the economic growth of any country. It can easily be considered as the support system of all flourishing businesses. Logistics aims at providing on time delivery of goods and services, to and fro from a factory to the end consumer, utilising cost-effective methods of transport and state of the art technology, in order to maximise efficiency. The logistics infrastructure in India is going through a modernisation program, keeping in mind the growth of e-commerce sector and manufacturing businesses alike. India is set to be the strongest economies in the near future, beating the likes of China and USA [1].

Chandra and Sastry (2004) have pointed towards two key areas that require attention in managing the logistics chains across the Indian business sectors – cost and reliable value add services. Logistics costs (i.e., inventory holding, transportation, warehousing, packaging, losses and related administration costs) have been estimated at 13-14 per cent of Indian GDP which is higher than the 8 per cent of USA's and lower than the 21 per cent of China's GDP (Sanyal, 2006a). In order to accommodate the large rise in production and consumption rates, the

logistics involved in meeting the demands of the consumer, needs to be refurbished. Some of the other challenges faced by the industry are the lack of skilled manpower as well as, a well-established IT structure to serve as the backbone of an efficient system. However, the government now considers amending certain policies to give India a competitive edge in the global logistics market. One of the main reasons, India's biggest competitor China is so organised is because of the well-established road and rail networks. Their highways are very well maintained which highly increases the efficiency of inbound and outbound logistics.

In the first part of the paper we have suggested the importance of warehousing along with future of warehousing in India. First part of the paper also includes the automation in warehousing using current national and international scenario as well as future of automation in warehousing. Government past policies about warehousing and new policies to shape the future, discussed in the second part of the paper. Packaging is the mechanization of safely enclosing or protecting products for sale, distribution, storage, and use. Definition of packaging, theoretical framework of packaging system, level of packaging, ways to reduce the packaging cost explained in the third part of the paper. Finally a case study of Project Sagermala for port handling is presented.

## **II. LITERATURE REVIEW**

Literature on logistics and SCM practices having different perspectives with a common goal of improving competitiveness and performance of logistics and SCM. There is plenty of published literature that explains SCM, there is a dearth of empirical studies examining logistics practices. Study of 10 companies in UK by Galt and Dale (1991) found that they are working to reduce their supplier base and to improve their communications with the suppliers. Fernie (1995) carries out a comparison of logistics in the grocery retailing industry and they found significant differences in inventory held in the logistics by the US and European grocery retailers. Tan and Wisner (2000) compare logistics in the US and Europe. Basnet et al. (2003) report the current status of logistics and SCM in New Zealand, while Sahay et al. (2003) discuss supply chain strategies and structures in India.

A. Deshmukh and H. Vasudevan (2016) examined the practices and issues related to the implementation of traditional and green supplier selection criteria among various MSMEs based in India. The proposed approach consisted of 12 criteria. A. Deshmukh and A. Chaudhari (2011) compiled 49 articles on traditional supplier selection criteria from 1992 to 2007. They reviewed, ranked and compared them with the criteria given by Dickson G. W. (1966), and Weber C. A., et al (1991). This study attempted to find out that whether the companies are following only traditional way for supplier selection or they are including green criteria also. It also explored major factors included in green supply chain along with the criteria for material selection process (Deshmukh A. & Vasudevan H., 2014). In UK Quayle (2003) surveyed supply chain management practice for SMEs (Small Manufacturing Enterprises) while Kempainen and Vepsalainen (2003) probe current SCM practices in Finnish industrial supply chains through interviews of managers in six supply chains. They analyse the change of SCM both in terms of operational practices and organizational capabilities. Success factor in developing and implementing SCM for Hong Kong manufacturing industries conducted using survey by Chin et al. (2004). Moberg et al. (2002) state that there is little literature on information exchange. Feldmann and Problem on how to establish an incentive scheme to furnish reliable and truthful information in supply chains examined by Feldmann and Muller (2003).

There is little literature on logistics and SCM practices in India. Available literature focuses either on the best practices (Joshi and Chopra, 2004) or on re-engineering of internal operations of the firms (Deshmukh and Mohanty, 2004, Kankal and Pund, 2004). In context of ICT, Saxena and Sahay (2000) compare the manufacturing intent to be an agile manufacturer and their Information Technology (IT) infrastructure in terms of scope of use, extent of use and integration of IT-based systems. The more recent studies are mainly based on questionnaire surveys and secondary data sources (Sahay and Mohan, 2003, Sahay et al., 2006). Vrat (2004) discusses some issues and challenges as well as the potential of SCM in India. All these studies find Indian firms generally lagging behind their counterparts in the developed countries.

### **III. WAREHOUSING**

Technically, warehousing is the act of storing goods that will be sold or distributed later. While a small, home-based business might be warehousing products in a spare room, basement, or garage, larger businesses typically own or rent space in a building that is specifically designed for storage.

#### **3.1 Importance of Warehousing**

**Location:** It becomes a central location for receiving, storing and distributing products. Whenever a shipment arrives, the warehouse personnel identify the products, sort and dispatch them to their temporary storage location. Storage is a process that includes security measures and maintaining an environment that maintains the products such that they do not lose their value. When it is time to move items, orders are retrieved, grouped, packaged and checked for completeness before being dispatched to their new destination.

**Value Adding Operations:** Logistics system reduces cycle times and overall inventories and lower costs. It also improves customer service. Warehousing adds value to operations by having the right quantity of products available at the right time at the right place. Order consolidation, order assembly, product mixing and cross-docking are some of the operations within a warehouse which add value to the overall logistics system.

**Economic Benefits:** Through efficient operations, storage capacity and a central location one can measure the economic benefits of a warehouse. Operations like consolidation cut outbound delivery costs for both the business and its customers. In this, products are delivered to a central warehouse, packaged together and shipped back out as one complete order. Accumulation operations allow a warehouse to balance supply and demand for seasonal and long-term storage. Such a system is important for products whose demand is perennial but the product itself is available at a specific time during the year.

**Safety Stock:** Warehouses can serve as part of a contingency plan to ensure outbound orders are filled in full and on time. Safety stocking is a method by which businesses maintain a predetermined number of inventory items at its warehouse. On the inbound side, safety stocking prevents delay of shipping customers order even if there is an emergency like a transportation delay or a batch of damaged goods. On the outbound side, safety stocking is helpful if the product in question is out of stock.

#### **3.2 Current Scenario in India**

In the complete logistics value chain, warehousing forms a very important link. It accounts for 5% of the Indian logistics market. The size of the Indian warehousing industry is pegged at about INR560 billion (excluding inventory carrying costs, which amount to another INR 340 billion (Ram Kripal Yadav, business article).

Warehousing forms 20% of the global logistics market. Warehouses were traditionally called godowns where goods from the time of production till the time of consumption were stored. Over time and with the changing role of the sector, traditional warehouses have transformed to collection and storage points, where raw material, intermediate and manufactured goods are collected, assorted, stored and distributed to the point of consumption/sale. The warehousing market in India is expected to grow at a rate of 35 to 40% annually, displaying high potential for growth over the next few years (Ram Kripal Yadav, business article). Currently, the sector is highly fragmented with small players holding small units distributed across states with many challenges:

- Inadequate skilled labour
- Inefficient material handling with outdated handling equipment
- Limited technology penetration and innovation
- Lack of world-class standards and specifications

Almost 92% of the market is dominated by unorganised players, while 70 to 75% of the organised market is being controlled by Public Sector Undertakings such as Central Warehousing Corporation (CWC), Food Corporation of India (FCI) and State Warehousing Corporations (SWCs). The current capacity of the organised warehouses controlled by corporates, cooperative and private sectors is 106.95 million metric tonnes of which the private sector has only 18 million MT, while Public Private Partnerships (PPP) are yet to start off in the sector.

Lately, the entry of international third-party logistics (3PLs) has given this sector a move in the direction of further maturity with new technology interventions, automated material handling devices and standards. This has intensified the competition with domestic players. In addition, the growing demand of companies for better services at lesser costs, has led to the emergence of organised warehousing in the country. As a result, warehouses are now stressing on having efficient inventory management systems with greater emphasis on value added services such as consolidation, labelling, packaging and re-packaging, bar-coding, distribution services, custom clearance service, customer service and reverse logistics.

### 3.3 Future Scenario in India

Various initiatives will have to be undertaken to reduce the skill gap in the warehousing sector in India. This will necessarily require a multi-pronged approach by various industry stakeholders. In addition, the training needs to be tailored to the requirement of warehousing such as cold chain, inland container depot (ICDs), etc. The training methods will also need to be upgraded using technology such as e-learning, online distance courses and practical classes through simulation. In the changing market scenario mass awareness initiatives need to be identified to reveal the importance of warehousing and career opportunities in this sector.

With the roll-out of GST, the government is working towards its pan-India implementation. Along with GST, the government has increased its coordination with state governments at all levels. India's warehousing technology market is growing steadily, with the upswing in demand from the logistics, retail, and manufacturing sectors, as well as through government promotion. Increase in IT adoption and knowledge infrastructure is seen to provide a boost to the growth and maturity of warehousing players in India. IT adoption carries the potential to increase the competitiveness of warehousing players by delivering substantial operating savings while also improving the quality of order fulfilment.

### 3.4 Automation in Warehousing

#### 3.4.1 Current International and Indian Scenario

In today's next-generation warehouses some of the technologies include pick/put-to-light, auto-guided vehicles (AGVs), voice-directed technology, wearables, radio frequency identification (RFID) scanning, and robotic applications. Robotics hit the manufacturing scene more than 50 years ago when Unimation, a small supplier, introduced an assembly robot to General Motors in 1961. Today, vision-guided robots have emerged in distribution centres (DCs) for loading/unloading, retrieval/put-away functions, pallet stack solutions, and goods-to-person applications. Robotic installations in the United States were up by 11 percent in 2014, and the International Federation of Robots predicts a 15-percent annual growth rate for robotics implementation globally (World Robotics Report 2016). Software solutions that drive the use of MH equipment, inventory optimization tools, and robotics are used currently in warehouses. A warehouse management system (WMS) is a modern warehouse example that exchanges real-time data with a voice-directed or put/pick-to-light application. Directed auto guided vehicles are also a modern example of software and automation link which instructs them to retrieve orders as well as track inventory levels. The goal of robotic implementation is not to curtail job opportunities but to create a smart warehouse with advanced productivity and increased throughput. In fact, robots are designed to work in conjunction with the labour force. Repetitious warehouse tasks, such as unloading a floor-loaded trailer or container, are being assigned to robots and automated processes.

Control automation blends material handling automation, automatic data collection, and human resources to achieve Computer Integrated Warehousing (CIW). Warehouse staff are linked to the computer via Radio Frequency Data Terminals (RFDT). RFDTs are typically equipped with hand held laser scanners. These systems are referred to as Real Time Warehouse Control Systems (RTWCS). Records are automatically and immediately updated when material is received, put-away, picked, and shipped. An RTWCS monitors request to put-away, move and pick material. The requests are loaded into a work queue, which prioritizes them, identifies available resources and then dispatches the best available resource. In many ways, the RTWCS becomes the director of all warehouse activities. For example, if there are no pending work requests, the RTWCS may dispatch a person in the warehouse to perform cycle counting. The result is that resource utilization is increased on all fronts - labour, space, equipment and inventory. As more accurate and timely information is provided, warehouse management is improved. A warehouse manager can obtain the current status of any order, storage location, inventory level, equipment activity, or labour utilization demand. Material tracking is so precise that it is possible to determine for a designated part vein how many are presently picked and still traveling with an order picker. Inventory accuracies of greater than 99% are achievable (Report of Indian Institute of Material Management).

#### 3.4.2 Future in Automation

International: Real Time Warehouse Control Systems (RTWCS) will be the biggest area of growth. The reduced costs of warehouse control systems will make these systems affordable for those who could not afford warehouse automation. The reduced costs and increased performance of warehouse control systems will result in automated warehouse control systems with traditional material handling equipment being a superior alternative to automated storage retrieval system (AS/RS). In United States, the trend is toward greater centralization of distribution warehouses to eliminate distribution layers (Report of Indian Institute of Material

Management). The goods will be directly transported from the central warehouse to the consumer of the finished goods. This trend will call for centralized warehouses to perform more small picks, which means, more single case and individual part picks. As a result, order picking is set to be second greatest area of growth in automation over the next decade. The automated order picking systems in the future will not require much labour but also generate more response with more flexibility as well as be more modular than systems today. Due to this trend which will take place in the future, conveyor systems would have an even bigger role. India: India needs to realize the importance of warehousing in automation. Companies, worldwide, have achieved significant operational efficiencies by adopting the right technologies. There has been unprecedented growth and now opportunities are abundant in manufacturing due to economic liberation in India. Warehousing can no longer be ignored by India when business plans are made in the future. It has tremendous scope in the current Indian Market.

#### **IV. GOVERNMENT INITIATIVES**

##### **4.1 Past Policies**

###### **4.1.1 Free Trade Warehousing Zone (FTWZ)**

It was established by the government to develop infrastructure to facilitate import and export of goods and services with the freedom to carry out trade transactions in the free currency. These zones are established close to seaports, airports or dry ports, to be easily accessed by road or rail. According to the Special Economic Zones Act 2005, a FTWZ is a special category of Special Economic Zone (SEZ) and is governed by the provisions of the SEC Act and the Rules. FTWZ are foreign territories to carry on business and are envisaged to be integrated zones to be used as international trading hubs. The minimum area of development under FTWZ is 0.1 million sqm, with 100% FDI approved.

###### **4.1.2 Logistics parks**

A logistics park is a stipulated area that facilitates domestic and foreign trade by providing services such as warehousing, cold storage, multi-modal transport facility, container freight station (CFS), ICDs, etc. that facilitate loading and unloading of cargo for distribution, redistribution, packaging and repackaging. They are developed in the vicinity of emerging industrial hubs such as Mumbai, Chennai, Hyderabad and Bangalore. Speciality logistics parks are being constructed for industries such as automobile, pharmaceuticals, agriculture, electronic hardware and aero industry. These parks are being connected through well-laid rail links and multi-modal transport facilities. Logistics parks are similar to FTWZs but also cater to the domestic market.

###### **4.1.3 Warehousing Development and Regulation Act, 2007 (WDRA)**

The government launched the negotiable warehouse receipts (NWR) system to help farmers gain access to loans from banks and allow the transfer of ownership of that commodity stored in a warehouse without having to deliver the physical commodity. NWRs are negotiable under the Warehouse (Development and Regulation) Act, 2007 and are regulated by the WDRA. These receipts are expected to improve the borrowing capacity of farmers as well as the quality of the bank's lending services in the agriculture sector, increase liquidity in rural areas as well as encourage better price risk management in agriculture commodities. The provisions of WDRA also lead to increased efficiencies in the lending portfolios of banks, as well as further enhance the interests of lending institutions in ensuring credit with reference to goods in warehouses. The NWRs will enable the transfer



of ownership of agricultural commodities stored in warehouses without having to deliver physical commodities to the financial institution. This in turn is expected to reduce the wastage/pilferage of goods during their transit from the place of production to the custody of banks/ financial institutions. The implementation of warehousing receipts under the supervision of WDRA is expected to ensure the smooth functioning of the system to foster the growth of warehousing in India.

## **V. NEW POLICIES TO SHAPE THE FUTURE**

Improved connectivity of the cities with the ports and various logistics parks are now being given primary focus. The government decides to plan a dedicated rail freight corridor to improve the efficiency with which the cargo is transported inland. Mr. Ram Kripal Yadav's (Minister of Government of India) forecast suggests, increasing the frequency of trains running between major cities and making them at par with passenger trains. Sources indicate that this will reduce the transportation time from the national capital to Mumbai from 60 hours to just over 18 hours.

On July 1<sup>st</sup>, 2017, as part of one of the greatest taxation reforms, present government implemented the GST as a unified system of tax collection from all the states and union territories. This move comes in the wake of economic turmoil throughout the country caused due to the outgoing taxation system. This stands as a boon for the logistics sector, as the simplified tax structure reduces the logistics cost by 2.5% as quoted by Frost & Sullivan in a recent press release (A. Deshmukh and Dr. H. Vasudevan 2013). This reform can be viewed as a concrete backing provided to the already existing brainchild of the government- "The Make in India" campaign. Introduction of GST alongside Make in India, mean a rise in investments in the sluggish logistics sector, providing India the required heads up in order to match the global standards. Implementation of GST stands beneficial for the transportation as well as the warehousing segments of the logistics sector. Prior to the reform, the container trucks carrying goods often wasted 30-40 hours on the interstate highways, due to different taxation systems which divided the different states. This reduced the efficiency of the business, and caused unnecessary delays along the route leading to increased overhead costs [7].

As mentioned by Mr. Yadav, India spends 14.4% of its GDP on logistics and transportation as compared to less than 8% spent by other developing countries. This data indicates that India does not have a very well-established logistics corridor. However, ease of norms involving Foreign Direct Investment (FDI), is estimated to strengthen the logistical infrastructure in the country. Most of the key logistics services are covered under the 100% automatic route for FDI. This indicates that India is a lucrative marketplace for several foreign based logistics giants. Figures suggest that 35 out of the leading 50 logistics companies have operational status in the Indian subcontinent. Furthermore, attractive tax incentives are catching the eye of foreign investors. For example, for the cold chain and warehousing facility, there is a 100% tax deduction on capital expenditure (excluding acquisition of land and financial equipment). As of 2017, India ranks at the 133<sup>rd</sup> position in terms of ease of doing business as compared to the 89<sup>th</sup> position held by its neighbouring country China. Hence, we can infer that there is a wide scope for improvement. The logistics industry globally is a \$400 billion and is expected to grow to a whopping \$1 trillion by 2020 and India is going to be a major contributor to this growth (Amit Sachan and Subhash Datta).

Packaging is the mechanization of safely enclosing or protecting products for sale, distribution, storage, and use. It also refers to the process of designing, evaluating, and producing packages. It can be simply understood as a coordinated system of preparing goods for transport, warehousing, logistics and sale.

The product packaging system (i.e. primary, secondary and tertiary packages and accessories) is highly relevant in the supply chain and its importance is growing because of the necessity to minimize costs, reduce the environmental impact and also due to the development of web operations (i.e. electronic commerce).

#### 6.1 Packaging Optimization

Package optimization is a process where supply chain specialists look for ways to make the product's packaging friendlier to the supply chain system. By making small tweaks to the way a product is packaged, they hope to save time and money in producing and transporting products (Quayle, M. 2003).

#### 6.2 Benefits of Packaging Optimization

##### 6.2.1 Optimize the Materials

The materials use for packaging could be holding your supply chain down. If you're using products that are expensive, wasteful or difficult to use, you're adding time and money to your supply chain that you can't afford. While you don't want to decrease the quality of your product or the perception of your brand, you can typically reduce or change your packaging materials without your customer noticing. Optimizing your packaging means making smarter decisions about the packaging of the product itself and the shipping materials you use to get the product from Point A to Point B. See if you can find alternatives, such as using hot-melt instead of tape, that can save you both time and money. Through package optimization, you should look at each and every material you use in the packaging process.

##### 6.2.2 Enhancement in Environment Sustainability

Creating plastic containers or cardboard boxes can have serious consequences on our environment. With so many companies looking for ways they can go green, package optimization can be one of the best ways to promote sustainable business practices. Companies can look for ways to use less materials and reduce their carbon footprint. Whether you choose to use a thinner plastic or recycled cardboard, there are many different ways to make your package more sustainable. Not only can this help save your company money, but you'll get bonus points with your customers for being environmentally friendly.

##### 6.2.3 Make Transportation Easier

When you're preparing cargo for shipment, you're looking at things like size and weight of your boxes of product. Not only does this include the size and weight of the product itself, but also the packaging it is in. If you're not using optimized packaging, you could be wasting space and weight that could be occupied by more products. Optimizing your product package allows you to eliminate the unnecessary excess you could be wasting your money on. By reducing the amount or changing the shape and size of the packaging both time and money can be saved.

##### 6.2.4 Finding the Right Package

When looking for the appropriate way to package your items, you need to consider both complexity and efficiency. To reduce complexity, you want to have as many similar packages as possible, but to improve efficiency; you want each item to have its best package. For companies with a wide variety of products, this can



be difficult to balance. Finding the optimal level of complexity and efficiency is crucial. When you find the right balance, you can lower your shipping costs, save space and weight with each shipment. You'll save money in the long run, too.

Unnecessary costs hurt everyone. From your company to your customer, spending money on wasteful practices means everyone is getting a bad deal. Properly optimizing your packaging can mean you save money and time all throughout the supply chain process — putting more money in your company's pocket. No matter what industry you're in, package optimization is important for both your business and the environment. Consider this when determining what kind of packaging you should be using for your company's products.

### 6.3 Theoretical framework of the packaging system

During recent decades, the importance of the packaging system and its different functions has been increasing. Traditionally, packaging is intended as a means of protecting and preserving goods, handling, transport, and storage of products. Other packaging functions like sales promotion, customer attention and brand communication have consistently grown in importance. It means that when a packaging developer makes a package, it needs to be designed in order to meet the demand from a sales and a marketing perspective, and not only from a manufacturing process and transportation network perspective (Sahay, B.S 2003).

### 6.4 Levels of Packaging

Packaging is built up as a system usually consisting of a primary, secondary, and tertiary level. The primary package concerns the structural nature of the package; it is usually the smallest unit of distribution or use and is the package in direct contact with the contents. The secondary package relates to the issues of visual communication and it is used to group primary packages together. Finally, the tertiary package is used for warehouse storage and transport shipping.

The packaging system is cross-functional, since it interacts with different industrial departments, with their specific requests of how packages should be designed, and these are often contradictory. Thus, packages have to satisfy several purposes, such as:

- Physical protection: the objects enclosed in the package may require protection from mechanical shock, vibration, electrostatic discharge, compression, temperature, etc.;
- Hygiene: a barrier from e.g. oxygen, water vapour, dust, etc. is often required. Keeping the contents clean, fresh, sterile and safe for the intended shelf life is a primary function;
- Containment or agglomeration: small objects have to be grouped together in one package for efficiency reasons;
- Information transmission: packages can communicate how to use, store, recycle, or dispose of the package or product;
- Marketing: packages can be used by marketers to encourage potential buyers to purchase the product;
- Security: packages can play an important role in reducing the risks associated with shipment. Organizations may install electronic devices like RFID tags on packages, to identify the products in real time, reducing the risk of thefts and increasing security.

### 6.5 Ways of reducing packaging costs

When companies are looking to reduce costs, their first focus is often what product design changes can be made to reduce material costs. Many completely overlook the option of refining the product's packaging design

instead. Improving and optimizing packaging design can not only save a company boatloads of money, but it can also provide better product protection and a reduced carbon footprint. Following are a few ways to reduce packaging costs:

- Importance of Research and Development

The cost of materials, tamper proofing, transportation durability factors, ease of handling, aesthetics and government regulations are a few points to keep in mind.

Identifying Necessary and Unnecessary Costs:

Is it necessary to:

Have an inner carton as well as an outer one?

Print all the information on the box?

Print the photo in colour or will black and white suffice?

Put a label on every box or can the information be printed directly on the box itself?

- Look at the bigger picture by thinking big and packing small:

Things to consider would include container loading configuration, inner and outer carton dimensions etc.

## **VII. CASE STUDY: PROJECT SAGARMALA**

India has a coastline stretching up to 7516.6 kms, which has numerous ports in Maharashtra, Gujarat, Tamil Nadu, Karnataka, Kerala, Andhra Pradesh, Goa, West Bengal, Pondicherry, Andaman & Nicobar and Lakshadweep. According to the ministry of shipping, around 95% of India's trading by volume and 70% by value is done by maritime transport. The Government of India plans to modernise the ports of India under the initiative known as Sagarmala. The Indian Government has allowed Foreign Direct Investment (FDI) of up to 100 per cent under the automatic route for port and harbour construction and maintenance projects. The government has also initiated National Maritime Development Programme (NMDP), an initiative to develop the maritime sector with a planned outlay of US\$ 11.8 billion. Its four primary goals are:

- Port modernization and new port development

It is important to expand the capacity of current port infrastructure and creating new ports with increasing volume. By 2025, a massive cargo volume growth is anticipated so there is a need for upgradation of current ports and development of new ones. Under the Sagarmala initiative, the Government plans to develop six new ports across five coastal states of India. A budget of 21 billion dollars has been forecasted for 189 projects. 42 of those projects worth around USD 3.6 Billion are already under implementation. Attempts to improve transshipment capacity by developing transshipment ports and hubs are being made. The operations costs for shipping lines for exporters and importers are likely to decrease. Vizhinjam (Kerala) and Enayam (Tamil Nadu) have been identified for development due to their geographical proximity to international shipping routes.

- Port connectivity enhancement

Improving port connectivity can have a positive impact on internal trade as well as Export and Import. At a projected cost 21 Billion Dollars, 170 port connectivity projects have been identified. In addition, the new National Waterways Act, 2016 aims to use of 111 inland waterways as a mode of transport across 24 states with the law's enactment, several inland waterways would become National Waterways and come under the stipulated regulations for development.

By 2025 coastal shipping traffic of about 180-200 MMTPA can be achieved approximately from current and planned capacities across industries coal, cement, iron and steel, food grains, fertilizers. This would translate into estimated INR 10,000-15,000 Crore saving annually. Additionally, about 60-70 MMTPA of cargo is expected to be moved via inland waterways by 2025. Infrastructure at ports and supporting infrastructure using rail/road and waterways to facilitate coastal movement are being created. Domestic waterways are cost effective and environmentally friendly means of transporting freight. The cost of transporting coal via coastal shipping is one-sixth of the cost of transporting it by railways. In consideration of the above, National Waterways 1, 2, 4 and 5 can be developed to play an important role in transportation. The optimized modal mix using inland waterways and coastal shipping would not only reduce logistics cost but also cut down emissions, reduce energy and fuel consumption. It is estimated that reduction of 12.5 MT in total CO<sub>2</sub> emission (2.5% of current emission through transport sector) and 1 Million KL in liquid fuel consumption (1.5% of current liquid fuel consumption by transport sector) can be achieved via modal mix optimization. Reduction in logistics cost will give impetus to our manufacturing sector and enhance export competitiveness.

Some of the types of connectivity projects considered are listed below:

- Coastal Berths at various major and non-major ports
- 37 National waterways prioritized for development in the first phase
- Heavy haul rail corridor from Talcher to Paradip
- Connectivity to Dedicated freight corridors
- Last mile rail and road connectivity projects
- Major rail connectivity projects
- Freight friendly Expressway projects connecting the major ports
- Development of Multi-Modal Logistics Parks
- POL Pipelines
- A new Special Purpose Vehicle, namely Indian Port Rail Corporation Limited has been set up as a public limited company to undertake last mile connectivity projects in Major Ports to improve their handling capacity and efficiency.
- Port Industrialization
  - A budget of 65 Billion Dollars has been forecasted for 33 port linked industrialization projects which will be undertaken by the Sagarmala Project and which will complement the Make in India vision.
  - Coastal Economic Zones (CEZs) have been proposed as economic regions hosting industrial clusters. CEZs are aimed at reducing time and costs required for Export/Import movement and domestic cargo, thus becoming a focal point of Port- linked industrialization. In addition, they have the potential to create direct and indirect employment of 4 million and 6 million respectively.
  - CEZs along India's Eastern and Western coastlines will reduce logistical costs industries. These will cover energy, material and discrete manufacturing.
  - Potential to develop two refineries and four petrochemical clusters along the coasts of India by 2025.
- Coastal community development

72 coastal districts host 18% population of India, so the development of these communities has become an integral aspect of overall socio-economic development of the country. Under the Sagarmala initiative, the plan is

to involve these communities as a part of the project and in the overall progress. 23 projects have been identified so far under this aspect of the initiative, which will be funded by MoS and Department of Animal Husbandry Dairying & Fisheries (DADF).

Sagarmala sub-projects are in sync with the Central Government's Industrial Corridors, Dedicated Freight Corridors (DFC), National Highway Development Programme (NHDP) and Special Economic Zones (SEZs) which will result in cost savings of 5 Billion Dollars in Logistics

## VIII. CONCLUSION

The forecast for the upcoming future in the logistics market of India seems promising. This is majorly due to the favourable reforms introduced by the government in order to reduce the logistics related cost. Ease of doing business due to improved government policies and initiatives like the Make in India campaign are said to boost the growth of the import-export segment as well as inland logistics. The Sagarmala project has already started the journey to make Indian ports as amongst the best in the world. This will ensure the growth of India as a global leader in terms of cargo handled annually and makes it at par with the key players in the industry. India is taking a step towards becoming a world renowned destination for establishing and expanding businesses. Considering all the above mentioned factors, we can almost be certain that logistics will play a major role in the projected economic development of India.

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