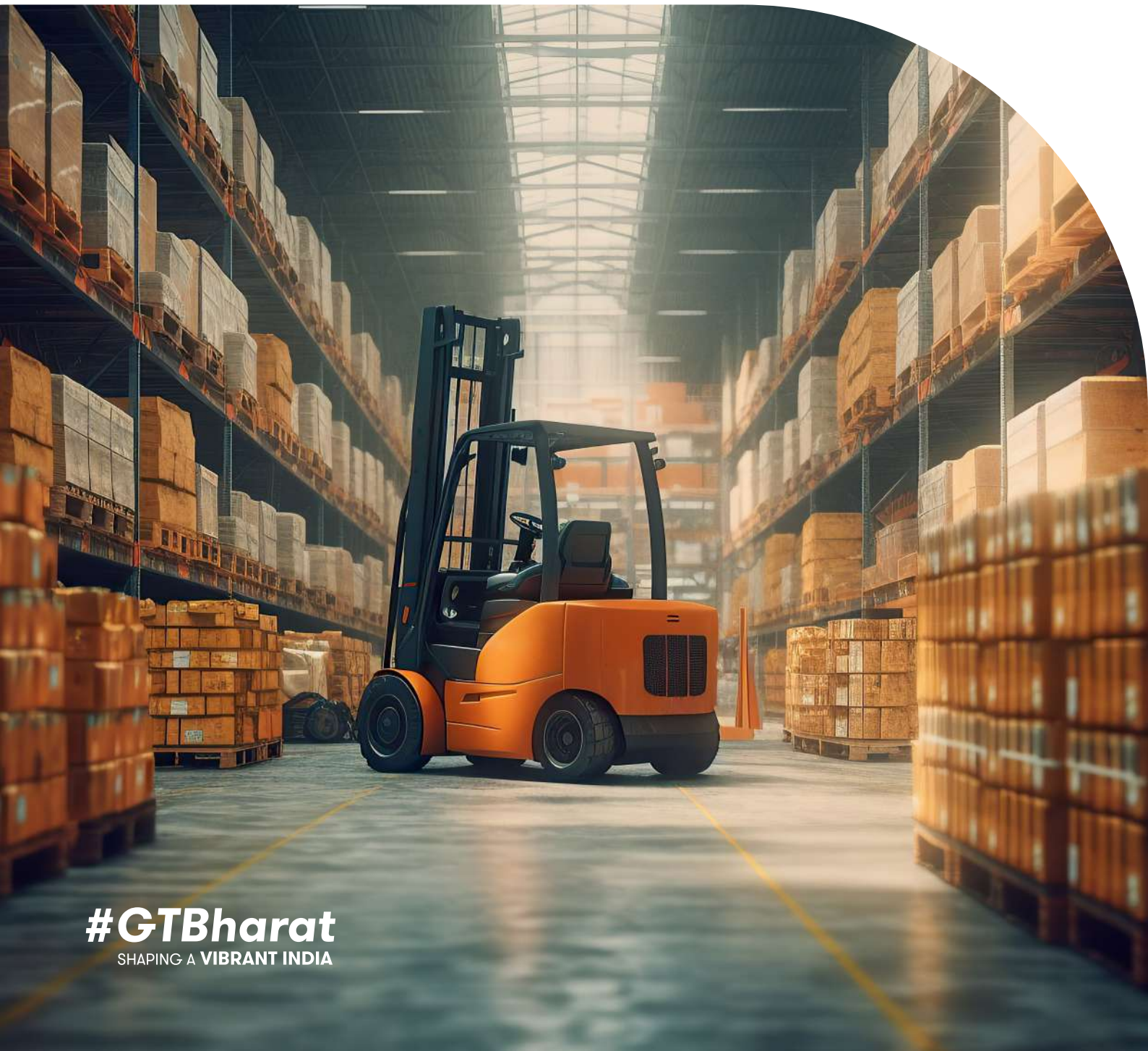
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Evolving landscape of warehousing and logistics in India: A road to becoming third-largest economy by 2027





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Abbreviations

ARAI	Automotive Research Association of India
AGV	Automated Guided Vehicles
AI	Artificial Intelligence
BIS	Bureau of Indian Standards
CAGR	Compound Annual Growth Rate
CNG	Compressed Natural Gas
CO2	Carbon Dioxide
CLAP	Comprehensive Logistics Action Plan
CMVR	Central Motor Vehicles Rules
DPIIT	Department for Promotion of Industry and Internal Trade
DME	Di Methyl Ether
DGT	Director General of Training
EV	Electric Vehicle
ECB	External Commercial Borrowings
ED	Ethanol Diesel Blend
FMCG	Fast Moving Consumer Goods
FAME	Faster Adoption and Manufacturing of Hybrid and Electric Vehicles
GDP	Gross Domestic Product
GST	Goods and Services Tax
HVAC	Heating Ventilation and Air Conditioning
IL	Institute of Logistics
INR	Indian Rupee
IWAI	Inland Waterways Authority of India
IGBC	Indian Green Building Council
IOT	Internet Of Things
JV	Joint Venture
LPI	Logistics Performance Index
LED	Light Emitting Diode
LSC	Logistics Sector Skill Council
LNG	Liquefied Natural Gas
MMLP	Multi-Modal Logistic Park
MoU	Memorandum of Understanding
MSME	Micro Small and Medium Enterprises

MoRTH	Ministry of Road Transport & Highways
MHE	Material Handling Equipment
MD	Methanol Diesel Blend
MSSDS	Maharashtra State Skill Development Society
NCR	National Capital Region
NIOS	National Institute of Open Schooling
NLP	National Logistics Policy
NMP	National Master Plan
NHLML	National Highways Logistics Management Limited
NBC	National Building Code
ODL	Open Distance Learning
PE	Private Equity
PLI	Production-Linked Incentive
PTPK	Per Tonne Per Kilometre
PM	Pradhan Mantri
PMGS	Pradhan Mantri Gati Shakti
PMKSY	Pradhan Mantri Kisan Sampada Yojana
PMKVY	Pradhan Mantri Kaushal Vikas Yojna
PPPA	Per Person Per Annum
RVNL	Rail Vikas Nigam Limited
RAAS	Robotics as A Service
SC	Schedule Caste
ST	Schedule Tribe
SPV	Special Purpose Vehicle
TMS	Transportation Management Systems
3PL	Third-Party Logistics
USD	United States Dollar
VC	Venture Capitalist
WMS	Warehouse Management Systems
WDRA	Warehousing Development and Regulatory Authority

Foreword by FICCI



Rizwan Soomar
Chairman, FICCI Committee on Logistics
CEO & MD- India Subcontinent, Middle East, and North Africa, DP World

I am happy to share with you the **FICCI-Grant Thornton Bharat** Knowledge Report on **'Evolving Landscape of Warehousing & Logistics in India: A road to third-largest economy by 2027'** to be released at the **Warehousing and Supply Chain** Summit organised by the Federation of Indian Chambers of Commerce and Industry.

The logistics and supply chain industry plays a pivotal role in the modern era of globalisation and rapid technological advancement. It serves as the backbone of global trade and commerce, ensuring an efficient movement of goods across borders and facilitating economic growth and societal well-being in numerous ways. The report provides a thorough examination of the present and future outlook of key logistic components, including warehousing, cold chain, and containers, shedding light on their current status and potential growth trajectories. It also examines the importance of robust and sustainable supply chains in today's interconnected and dynamic global value chains.

As the industry forges ahead, it is crucial to acknowledge the key drivers that propel the growth of warehousing, cold chain, and container solutions. Understanding these factors allows us to leverage opportunities and navigate the challenges that lie ahead. The report captures both challenges faced by the industry and the myriad opportunities that can be harnessed to promote sustainability and resilience.

The recent government initiatives and policies have been instrumental in positively shaping the logistics landscape. The National Logistics Policy and the National Warehouse Policy stand as beacons, guiding the way towards a more efficient and integrated logistic ecosystem. The Government's focus towards the development and expansion of Multi-Modal Logistics Parks (MMLPs) has further reinforced operational efficiency, ensuring sustainable logistic practices and the pursuit towards further reduction of the overall logistics cost. These parks serve as key nodes that optimise transportation, improving the country's freight logistics sector, ultimately contributing to enhanced efficiency in the entire logistics network.

In our collective journey towards sustainability, the standardisation of warehousing practices stands out as a critical milestone. By embracing standardised practices, we can not only enhance operational efficiency but also elevate the overall quality of services offered. The report also delves into the realm of 'green Logistics,' exploring various interventions and initiatives designed to transmute the environmental footprint of the logistics industry.

The FICCI-Grant Thornton Bharat Knowledge Report also dwells on the aspect of skill development, role of private investments, and impact of technology, amongst other key areas. It presents a comprehensive view of the transformative actions required for development of sustainable and reliable logistic infrastructure in India.

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

Foreword by Grant Thornton Bharat



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As the world continues to experience unprecedented shifts in economies, industries and environmental challenges, the spotlight on sustainable supply chains and logistics has never been more crucial. It is with immense pleasure and a sense of profound importance that we introduce this comprehensive report on building a reliable and resilient warehousing and logistics ecosystem, focusing on the dynamic and evolving market in India.

The report captures the developments in the multifaceted world of warehousing and logistics supply chains, offering a macro analysis of the present landscape while presenting the outlook as well. In the age of globalisation, where seamless movement of goods is fundamental to economic growth, understanding the key industry drivers for warehousing, cold chain and container operations become indispensable. Equally vital are recognising the challenges faced and the opportunities that lie ahead in this vibrant and dynamic sector.

In addition, this report discusses the pivotal role played by the Government of India in shaping policies to promote a resilient warehousing and logistics ecosystem. The National Logistics Policy and the National Warehouse Policy are powerful initiatives that underscore the Government's commitment to catalysing growth in this sector. Furthermore, the report outlines various support measures extended to cold chain logistics, multimodal transportation, and supply chain efficiency enhancement programmes.

One of the report's crucial facets is the exploration of sustainable practices in the industry, capturing the spirit of our times. From standardisation of warehousing to green logistics interventions, we are witnessing a transformative shift towards environmentally responsible operations. Energy efficiency, sustainable packaging, green transportation and location proximity are key factors driving change and fostering a sustainable approach to supply chain management.

Undoubtedly, the success of any industry depends on the skilled workforce that drives it. In this context, the report examines skill development initiatives for warehousing and supply chain logistics in India, highlighting the importance of investing in human capital.

Private sector participation is instrumental in propelling innovation and growth, and understanding the obstacles is vital to forging a more robust future. This report addresses the role of private investments, talking about both opportunities and challenges faced in this area.

Technological progress is revolutionising every aspect of our lives, and the warehousing industry is no exception. The report explores the exciting world of automated warehouses, robotics, warehouse management systems and artificial intelligence. These transformative technologies are paving the way for more efficient, reliable and sustainable logistics operations.

We hope this report serves as a guiding light for policymakers, industry stakeholders, investors and anyone invested in fostering a reliable, resilient and sustainable warehousing and logistics ecosystem. Together, let us seize these opportunities and navigate the challenges to create a better future for this vital industry and contribute to a more sustainable world.

Executive summary

For India to become the third largest economy by 2027, it is imperative for the country to increase the production capacity and efficiency of existing infrastructure, while the demand continues to register growth within the country and worldwide. According to the present global demand outlook, there is a big opportunity for Indian businesses to strengthen their supply-side indicators in global markets, competing with global counterparts. Currently, the manufacturing sector contributes approximately 17%[1] to the GDP and its share is expected to increase further. The merchandise exports are also at an all-time high at USD 447 billion[2] in FY23 with a significant potential for growth. With initiatives such as the PLI scheme, Make in India, Atmanirbhar Bharat and Skill India, industrial production in India is expected to increase in near future. As a result, with the increased flow of goods there will be additional rigor on the existing logistics infrastructure. The logistics ecosystem, comprising storage and transportation facilities, is likely to be pushed further for improved efficiency and availability so that the logistics costs are low and competitive. The logistics sector is already growing at a growth rate of 10–12% Y-o-Y contributing to 14.4%[3] to the country's GDP. The sector employs more than 20 million people. Within the logistics sector, the warehousing storage sector is growing even faster at a CAGR of 15.64%[4] and expecting to reach a market size of USD 35 billion by 2027.

However, the sector is struggling with multiple challenges and bottlenecks that lead to high logistics costs. These include unfavourable inter-modal mix, inefficient fleet mix, inefficient material handling, high congestion on the roads as well as procedural bottlenecks. To address these issues, the Government has taken significant initiatives such as setting up of 35 multi-modal logistics parks in the country to enable use of possible efficient mode of transport, aggregation/ disaggregation centres to enable use of bigger size of fleet that also leads to reduced pollution and reduction in freight



travel cost and to develop best in class warehousing facilities with mechanised and technology-driven processes to minimise losses. Moreover, the PM Gati Shakti programme is aimed at improving the roads, railways, ports and airways infrastructure in the National Infrastructure Pipeline programme with specific focus on logistics infrastructure that enables congestion free roads, ports, etc. As per estimates, use of railways as a mode of transport is 45% cheaper and render 65% lower CO2 emissions.[5]

The Government has taken multiple regulatory initiatives in recent times that give a promising push to the logistics and warehousing sector in the country such as the GST Act, the National Logistics policy, Handbook on Standardisation of warehouses, MMLPs, etc. In addition, the technology interventions are adding procedural efficiencies and changing consumer behaviours.

Recently, the warehousing sector's push is visible more towards the Tier 2 and 3 cities driven by 3PL and e-commerce players. There is a renewed demand for Grade A and B warehouses demonstrated by a YoY growth rate of 21% in top eight cities of the country, out of which Delhi NCR, Mumbai and Bengaluru contribute more than 50% of the warehousing stock. Businesses are more conscious of sustainable practices towards greener logistics initiatives, inviting new opportunities for renewable energies contributing substantially to India's overall net zero carbon footprint target of 2070.

The report is a quick compendium and reference for information and macro views on the overall market outlook of the sector, key sector trends, persisting challenges and opportunities, government policy initiatives and technological advancements in the warehousing and logistics industry.



01

Market outlook: Warehousing and logistics supply chain



The logistics industry in India is witnessing significant growth and is projected to reach USD 380 billion by 2025, growing at a healthy rate of 10%–12% year-on-year[6]. The logistics industry serves as the backbone of numerous industries and plays a vital role in ensuring the efficient movement of products and services domestically and in global markets. Logistics encompasses a wide range of activities, including transportation, storage, packaging, inventory management, order processing and distribution, ensuring a smooth flow of goods and services from the point of origin to the final destination.

Innovations such as transportation management systems (TMS) and warehouse management systems (WMS) have led to substantial progress in the logistics sector. These technological breakthroughs have enabled logistics companies to enhance operational efficiency, reduce expenses and improve customer service.

In terms of transportation modes, the logistics sector in India relies predominantly on roads, accounting for a 73% market share, followed by rail (18%), water (5%) and air (5%)[7]. The dominance of road transportation can be attributed to the extensive road network and connectivity across the country. However, the Government has been focusing on improving other transportation modes such as rail and water to reduce logistics costs and enhance efficiency.

On the storage side, India's warehousing, cold chain and container markets are witnessing strong demand and growth in future.

India's warehouse market plays a crucial role in the global supply chain. It is projected to reach USD 34.99 billion (INR 2,872.10 billion) by 2027, expanding at a compound annual growth rate (CAGR) of 15.64% from 2022 to 2027[8]. The demand for warehouse facilities is driven by sectors such as third-party logistics (3PL), manufacturing, retail, e-commerce, and fast-moving consumer goods (FMCG). The Government's initiatives, including Make in India and the Production Linked Incentive (PLI) scheme, have further boosted manufacturing prospects, contributing to the demand for warehouses.

Furthermore, India's warehousing is pivotal for resilient supply chains, driven by e-commerce growth, government support, and technological advancements. In FY 2023, the Indian warehouse market experienced an unprecedented surge in transactions, with a total of 51.3 million square feet. Notably, Mumbai, Bengaluru, and Kolkata stood out as the cities witnessing the highest demand for warehouse facilities. Among the key contributors to this growth, the 3PL sector took the lead, accounting for 39% of the transactions. Following closely were the retail sector with 13%, e-commerce with 7%, fast moving consumer durables (FMCD) with 4%, FMCG with 3%, and other sectors with 5% of the total transactions[9]. The Government's initiatives have played a significant role in driving the demand for warehouse facilities, as they have focused on promoting manufacturing and improving logistics infrastructure in the country.

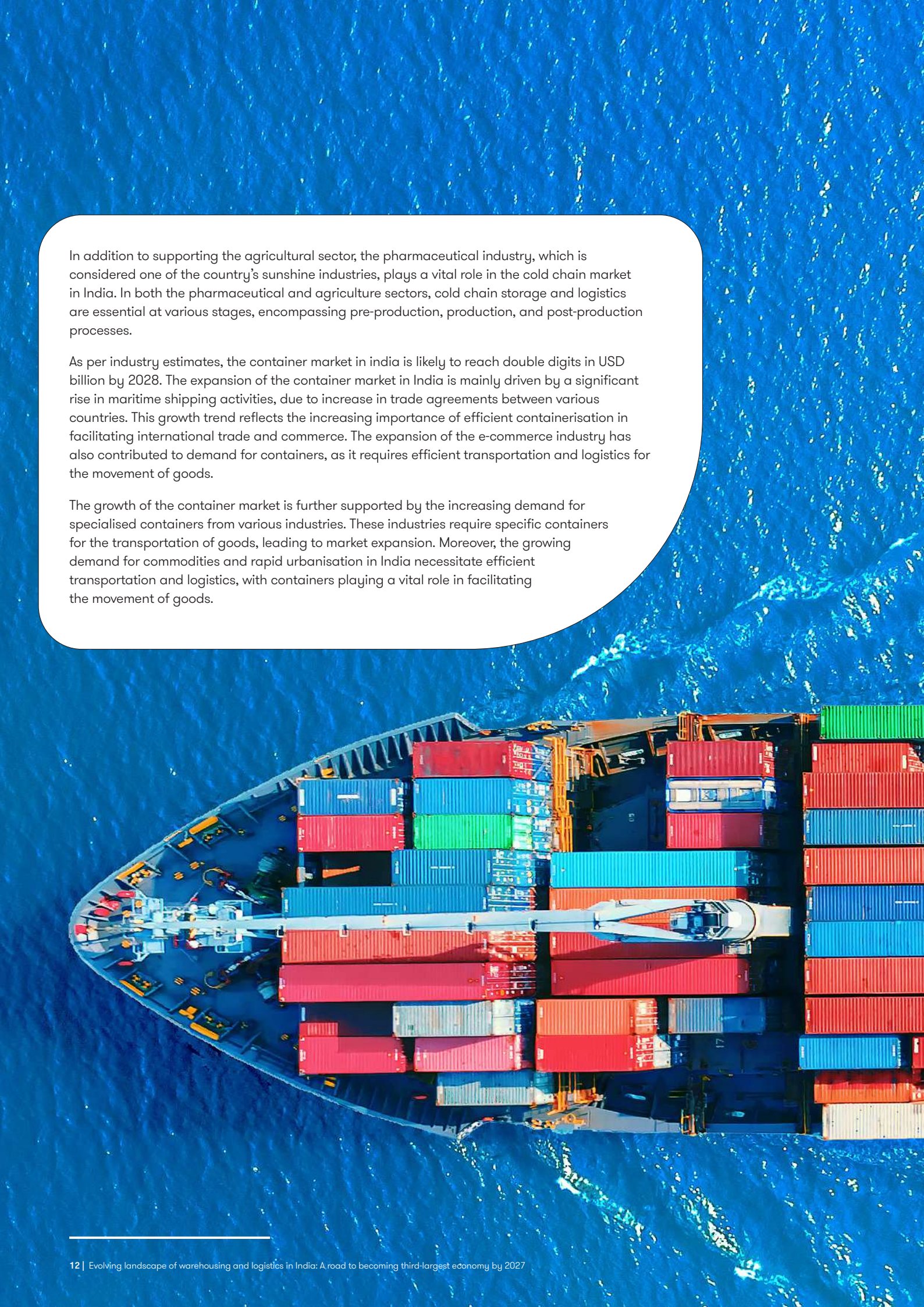
Moreover, the cold chain market in India is also experiencing strong and steady growth. Industry estimates the present market size to become multi-fold with CAGR ranging in double digits. The cold chain industry primarily consists of temperature-controlled storage and transportation services. It plays a crucial role in supporting India's large and diverse agricultural sector, given the country's status as the largest producer of milk, the second-largest producer of food grains and horticulture output, and the fifth-largest producer of meat.

Factors driving the growth of the cold chain market include the expansion of organised retail, the development of the food processing industry, increasing international trade of perishable goods, and government initiatives to reduce food wastage. The Government of India has shown proactive support for the cold chain industry by implementing initiatives such as the Scheme for Cold Chain & Value Addition Infrastructure and Pradhan Mantri Kisan Sampada Yojana (PMKSY). These programmes aim to incentivise investments in cold chain infrastructure, enhance storage and transportation facilities for perishable goods, and promote overall growth in the sector.

In addition to supporting the agricultural sector, the pharmaceutical industry, which is considered one of the country's sunshine industries, plays a vital role in the cold chain market in India. In both the pharmaceutical and agriculture sectors, cold chain storage and logistics are essential at various stages, encompassing pre-production, production, and post-production processes.

As per industry estimates, the container market in india is likely to reach double digits in USD billion by 2028. The expansion of the container market in India is mainly driven by a significant rise in maritime shipping activities, due to increase in trade agreements between various countries. This growth trend reflects the increasing importance of efficient containerisation in facilitating international trade and commerce. The expansion of the e-commerce industry has also contributed to demand for containers, as it requires efficient transportation and logistics for the movement of goods.

The growth of the container market is further supported by the increasing demand for specialised containers from various industries. These industries require specific containers for the transportation of goods, leading to market expansion. Moreover, the growing demand for commodities and rapid urbanisation in India necessitate efficient transportation and logistics, with containers playing a vital role in facilitating the movement of goods.





02

Key industry forces



Following are the key industry drivers propelling the sector's growth story:

Government initiatives and infrastructure development

Government initiatives aimed at infrastructure development, logistics improvement, and multi-modal connectivity are playing a crucial role in transforming the logistics industry in India. Reforms such as GST and the establishment of free trade logistics parks and warehousing zones have enhanced industrial growth and efficiency.

Shift in global manufacturing

India's attractiveness as a manufacturing destination has led to a significant global manufacturing shift, with international firms relocating their production focus to the country. This has created an improved demand for warehouses and logistics services. Moreover, the implementation of the PLI scheme has also played a significant role in boosting domestic production in India.

Technology-led transformation

The rise of new-age, technology-driven logistics start-ups leveraging technology such as IoT, robotics and AI is driving innovation and competitiveness in the industry. These progresses enhance productivity and overall industry growth, while the flourishing e-commerce sector drives the demand for large-scale warehousing and distribution centres to cater to the growing online shopping trend.

Cold chain industry growth

The growth of organised food retail and the processed food sector is driving the need for a robust cold chain infrastructure. Efficient supply chain management and strong cold chain networks are established to meet the increasing demand for temperature-controlled storage in the organised retail and healthcare sectors, including vaccines, biopharmaceuticals, and clinical trial materials.

Containerisation and growth in International Trade

The expanding economy in India has led to a rise in containerised transportation of goods to and from international markets. Port infrastructure development and initiatives such as the Sagarmala Programme have improved port connectivity, capacity and handling capabilities, making Indian ports more attractive to shipping lines. Government initiatives promoting trade facilitation and ease of doing business have further encouraged the adoption of containerisation, fuelled by the growth of domestic manufacturing and industrial sectors.

If change is the only constant, there so is resistance to change. We come across many organisations that are keen to embrace change and at times even experiment with it. In equal numbers, if not more, we see organisations resisting change. Well, to be honest it is people in those organisations resisting change. For example, one massive government intervention that has opened up floodgates of opportunities in the SCM landscape, especially warehousing, is GST. No longer do organisations in India have to plot their warehouse infrastructures keeping statutory obligations in mind. Now with one nation one tax corporations have the potential to cater to their clients from one, four or ten warehouses- not because it suits tax savings, but because it is efficient. This in effect also provides opportunities to consolidate warehousing infrastructures and also put into play newer technologies or automation that are currently relevant and future ready."

"Next 5-7 years are golden for Warehousing, Logistics and SCM infrastructures to come up even though there has been a momentary delay due to covid. We see a lot of action in coming days.



Mr. Anil Syal
President
Safexpress Private Limited



A cold chain indicates the transportation and warehousing of temperature-sensitive products from the point of origin to the point of consumption, which increases shelf life and prevents spoilage. Today, India's Cold Chain Market is expected to reach US$ 46.30 Billion by 2028 with a CAGR of 12.3%, making it one of the most promising fields in the warehousing and logistics industry. Previously cold storage facilities in India had only been limited largely to storing perishable horticulture produce such as fruits and vegetables but now the sector is expanding into numerous other products as well.

Currently the cold chain industrial clusters are concentrated in major metro cities, but with the change in consumption patterns and government reforms investment activity in smaller cities can be seen. Due to these new trends Cold Chain Industry has massive potential all over the nation, from Tier 1 to Tier 3 Cities and smaller towns.

Thus, the industry is more likely to attract significant capital inflow and new capacity creation in the forthcoming years. In the coming years, the rise of Third-Party Logistics, Quick Service Restaurants, retail, E-commerce and most importantly the Foodservice Industry is going to require comprehensive End to End Cold Chain Services. Thus, with the growth in India's economy the cold chain sector remains a crucial driver in India.

Mr. Vivek Dubey
Sr. General Manager
Hind Terminals Pvt Ltd.

03

Key industry challenges and opportunities



Due to fierce competition and surging goods and services demand, the supply for warehousing and logistics services in Tier 1 cities and metropolitan areas is experiencing saturation and shortfall, leading to reduced profit margins. Moreover, there is a growing realisation that Tier 2 and Tier 3 markets hold untapped potential to explore where a large share of the transactions are driven from.

Some of the important reasons for the supply side shortage can also be inferred from the fact that 30%-40% of vegetables and fruits produced is completely wasted due to lack of proper cold chain storage facilities[10]. Moreover, India is the largest, dairy producer in the world right now, producing around 24% of the global milk production, yet due to shortfall in cold chain failures in infrastructure and operation in the industry about half or more of the milk produced in the country is wasted. Even in the pharmaceutical sector, especially in the post COVID-19 era, due to the use of vaccines and injectables, the need for greater resilient and more efficient supply chain has become even more necessary than before.

While this is an opportunity, there are challenges as well that the industry is dealing with to meet supply side needs. Following is a brief snapshot of those for a quick reference:

Warehousing – Challenges and opportunities

Challenges in India's warehousing sector

Land-related issues: Increased urbanisation has reduced availability of commercial lands around India's urban and even peri-urban centres. It is further worsened by social difficulties in availing land due to push back from certain sectors of the local unorganised economy. It has become a 'push and pull' factor between unorganised encroachment and the organised warehousing industry in the last few years.

This is more prominent in various highly urbanised but crowded states such as UP and West Bengal.

Legal and regulatory challenges: There are multiple challenges to licencing and getting permissions from competent authorities as these vary across various states and UTs. Furthermore, a lack of national 'single window' system is causing additional friction in the sector.

Opportunities in India's warehousing sector

Growth in organised retail: Currently, organised retail is the biggest boost to the warehousing sector and is expected to be so in the coming years. This is primarily due to two factors — first is the massive footprint of the industry that sees the whole of urban and semi-urban India to come under its sway.

Second is the high volume of FMCG goods that this new retail sector consumes. Producing the need for high quality storage for such goods and driving the need for new and existing warehouse infra in the nation.

Growth in the electric vehicles (EV) and EV components market: The EV ecosystem — from production, technology servicing and batteries to charging stations — is producing a unique demand for warehouses in India's urban clusters.

Challenges in India's warehousing sector

High rate of documentation: Multiple yearly renewals are required from multiple government agencies and bodies in respective states. Without a national digital repository, it proves to be a challenge for various inter-state and intra-state warehousing organisations.

Labour-related challenges: Labour is a consistent problem in the warehouse sector, due to both regulatory challenges and lack of quality manpower.

Most of the labour shortage in the sector is chronic and fed by the seasonal availability of lab our, which is unique feature of a largely agriculture driven economy like India.

Tax-related challenges: Tax related challenges in claiming input cost from the GST regime in case of warehouse construction and pre-fabrication is a major sectoral challenge.

Opportunities in India's warehousing sector

Make in India opportunities: The importance given to manufacture and distribution of bulky but expensive goods such as textiles, pains, chemicals, telecom gear and automotive parts will drive the warehousing sector in the coming years.

Export-led growth: India's growth story is not only the story of the country's domestic manufacturing and markets but also the massive export potential of its goods. India's merchandise export grew substantially despite slow post-COVID-19 recovery at around 6%.[11]

Increased regulatory and Government support: Despite Regulatory inertia, there has been substantial regulatory gains in the warehousing sector due to launch of the National Logistics Policy in 2022 and also due to increased push for digitisation across various central regulatory functions.

Cold chain: Challenges and opportunities

Challenges for India's cold chain market

The cold chain market in India is fragmented, and cold chain logistics and storage is greatly concentrated in four major states — UP, Gujarat, Maharashtra and West Bengal[12].

Opportunities for India's cold chain market

The renewables sector, particularly solar energy, can be a great boost to the sector's power woes in the next decade. This is particularly true for agriculture and dairy cold chains, which have access to more unoccupied land.

Challenges for India's cold chain market

Inadequate and unreliable power supply in most states: The power supply situation in the country has worsened over the last six years. Rising annual average and summer maximum is pushing the electricity grid to its maximum short fall. In April 2022, nationally the electricity supply fell short by 1.6%[13] during which most states saw the highest amount of power cuts. Notable among them are Gujarat, Rajasthan, Haryana and Andhra Pradesh.

The industrial sector is first hit during power shortages in the summer to save lives, thereby hindering cold chain function in many states.

High cost of cold storage space for buyers, which can be almost double that of developed nations. This is primarily due to the high cost of energy and lack of automation and application of AI in the sector that creates inefficiencies.

High cost of fuel, since India is a net importer of energy, further troubles the sector in the face of unreliable power supply.

Inadequate last-mile infra in most rural, peri-urban and even urban settings in India causes both rise in cost and difficulties in maintaining the integrity of the cold chain in last mile delivery.

Opportunities for India's cold chain market

The National Logistics Policy and the curtailing of various regulatory overloads will, in the long run, streamline the complexities in the sector. Particularly the formation of high technology MMLP and dedicated freightways systems will, in the coming days, significantly augment the operations of the cold chain sector in India.

Growth of India's agricultural and marine sectors for domestic and exports markets will provide a sustained and long-term demand for cold chain investment. This investment is expected to be both in capacity and in personnel across the country, particularly in the coastal states.

Increased AI & ML application in the cold chain sector in India is expected to reduce costs significantly by pre-empting peak power demand and mapping alternative low-cost usages.

Research and design: Indigenous research and design in the sector, from new more power-efficient vaccine transportation systems to new materials in insulation and temperature control will all drive efficiencies and growth in the cold chain sector.

04

Regulatory measures





The warehousing and logistics industry is witnessing substantial growth and achieving its intended outcomes as a result of implementation of its intrinsic policy reforms. The Government's initiatives in this sector are expected to drive progress further. India's impressive performance in the World Bank's Logistics Performance Index (LPI) 2023 is a testimony to that. India has jumped six places to rank 38 in the LPI 2023. The performance of the Logistics Data Bank has played an imperative role in the ranking by inducing healthy competition among all ports with performance benchmarking. The launch of National Logistics Policy by the Government of India and the state governments to have their own state logistics and warehousing policies have given direction to the industry for future. Moreover, granting infrastructure status to the logistics industry with 100% FDI opens great avenues for fiscal initiatives creating multiple opportunities for continued growth.

Moreover, the introduction of a multi-modal transportation and warehousing network is expected to enhance efficiency in the countrywide movement and storage of goods. Emphasising the digital aspect, the Government aims to upgrade the existing system, resulting in rapid and more accurate communication, benefiting the industry significantly. To ensure the effective implementation of policies and necessary corrective measures, a robust monitoring system with periodic audits is in place.

India aims to improve its ranking in the Logistics Performance Index to 25 and reduce logistics costs to global benchmark within the next five years, as outlined in the National Logistics Policy. Achieving these goals will transform the logistics industry into a catalyst for growth and a key contributor to India's ambition of becoming a 3rd largest economy by 2027.

Sector-specific government reforms:

National Logistics Policy (NLP): Launched in September 2022 after extensive consultations, the NLP takes into account both the supply and demand aspects of the sector. It is a policy that emphasises process re-engineering, digitisation, and multi-modal transport. The aim of this policy is to address the high logistics cost, which negatively affects the competitiveness of domestic goods in the global market. It aims to reduce the current logistics cost to be close to the global benchmark. Furthermore, the policy focuses on establishing a single-window e-logistics market and prioritises the development of skills, competitiveness, and employment opportunities for micro, small and medium enterprises (MSMEs). The policy talks about data-driven decision support mechanism for an efficient logistics ecosystem. It acts as an umbrella offering under which various initiatives are planned.

The NLP introduces the Comprehensive Logistics Action Plan (CLAP), which encompasses eight focal areas ranging from digital integration to the facilitation of logistics park development. The key initiatives discussed align with the principles of the PM Gati Shakti (PMGS) National Master Plan (NMP)[14], emphasising the importance of convergence and collective efforts for success. The PMGS aims to eliminate barriers between different departments and ministries at the state and union territory levels by integrating relevant data into a National Master Plan and respective State Master Plans (portals). A similar framework has been considered for logistics planning, recognising the federal structure of administration and the need to adopt an approach that encompasses both the unit and the whole. Therefore, state and city-level logistics plans play a vital role in enhancing the country's logistics infrastructure.

The CLAP not only outlines government initiatives but also ensures a conducive environment for private sector participation. The sectoral plan demonstrates the government's strong commitment, while the facilitation of logistics park development provides a blueprint for the establishment of logistics and network logistics parks.

Comprehensive Logistics Action Plan (CLAP) Framework and key initiatives

01 Digital logistics systems



Digital integration of systems across Ministries **ULIP** Framework - Integrating multiple data sources

02 Standardisation of physical assets & benchmarking service quality standards



Enhance interoperability, minimise handling risks, undertake process optimisation, and improve EoDB, through standardisation of physical assets and benchmarking of service quality standards

03 Logistics human resources development and capacity building



Logistics human resource strategy and guiding principles, **line ministries** to develop **action plans** to address **skill development** and internal **capacity building**

04 State engagement



Support for state/city level logistics plans, set up institutional framework to take action at city/state level, measure and monitor action by states and rank them

05 EXIM (Export-Import) logistics



Addressing **infrastructure and procedural gaps** in EXIM connectivity creates **efficient and reliable logistics network**, with transparent and streamlined **cross-border trade facilitation, trade competitiveness** and greater integration with regional and global value chains

06 Service improvement framework



Improving regulatory interface to enable seamlessness between sectors, promote standardisation, formalisation, interoperability; eliminate fragmentation in documentation, formats, processes and liability regimes; reduce gaps in regulatory architecture.

07 Sectoral plan for efficient logistics



Sectoral Plans for Efficient Logistics **(SPEL)** aligned with PM Gati Shakti for each sector with underlying philosophies of **inter-operability, resiliency, sustainability and innovation**. Specifically SPEL would (i) address **logistics issues** pertaining to **infrastructure, processes, digital improvements, policies and regulatory reforms, and capacity building** for better workforce, and (ii) prioritise **cross-sectoral cooperation to complement and not duplicate efforts and focus** on optimisation of **modal mix**

08 Facilitation of development of logistics parks



Logistics parks (e.g., MMLP, AFS, ICD, CFS, CT, etc.) are hubs for **intermediary activities** (storage, handling, value addition, inter-modal transfers, etc.) in the supply chain connected by a transportation network Logistics parks: **Draft framework guidelines** to facilitate development with focus on encouraging **private investment. Create a network of logistics** parks by mapping them on the PM Gati Shakti NMP, for enhanced visibility, improved logistics efficiency, optimum utilisation and connectivity.

As per DPIIT statistics, 21 out of 28 states have formulated their state logistics policies and the rest are in the process of formulation. Granting industry status, relaxation in laws in the warehouse sector, exemption in electricity duty, promoting private participation are some of the key tenets instrumental in giving a push to the warehousing and logistics sector in the country. Following are few key highlights of state logistics policies across India:

01 Grant of industry status

02 Incentivising development in economically backward areas

03 Dedicated logistics zone and truck terminals

04 Land buy option on successful business operation after completion of lease period and discounted land conversion

05 Promotion of public private partnership as business model

06 Exemption on electricity duty

07 Relaxation in labour and industry laws in warehouse

08 Innovation and start-up fund

09 Incentive for increasing supply chain visibility by use of sensors in trucks and adoption of quality management system, etc.



The Entire Logistics and Supply Chain industry celebrated when the honourable PM Sri Narendra Modi launched the National Policy on 17th September, 2022. This Day has marked a very important milestone in India's journey to becoming a manufacturing & supply powerhouse for the entire world which in the long term is going to augment the Warehouse and Logistics sector in the country.

The launch of the National Logistics Policy is a Game changer for India. It is comprehensive, far sighted and is bringing a transformational change in the logistics and warehousing Industries. It dove tails into the objectives "Make in India" which will enable to India to become a preferred manufacturing, globally competitive with a highly skilled work force. This coupled with the rapid pace of Modern expressways, connecting Multi modal parks, ports and airports is driving the rapid change in the logistics and supply chain infrastructure of the country.

We are confident that the Comprehensive and Integrated Logistics policy will help achieve the larger goals in India, making it globally competitive and power India into the Top five nations in the world with a GDP of INR 30 Trillion Dollars by 2047.

Mr. Manu Bhalla
President
Warehousing Association of India



"The logistic ecosystem in India has been catalysed by progressive government initiatives, like PM Gati Shakti National Master Plan (NMP), National Logistics Policy (NLP), Sagarmala, and Bharatmala. These initiatives will nurture multimodal networks that enhance last-mile connectivity and bring cost and efficiency benefits across supply chains.

Digital technologies and solutions such as ICEGATE, ULIP, and E-Logs will augment efficiency, transparency, speed of freight movement, and ease of doing business, helping create a robust and globally competitive logistic ecosystem in India.

Developing green supply chains through the integration of sustainable measures across logistic networks will continue to be an important priority. It is critical for public and private partnership to consolidate efforts towards reduction of carbon emissions and adoption of clean and renewable energy interventions in logistic operations."

Mr. Ashwani Nath
Chief Commercial Officer -Logistics
DP World Subcontinent

05

Enabling seamless inter-modal freight transportation



There is significant scope of improvement for the industry to optimally realise the benefits of seamless transfer of merchandise from one mode of transport to a more cost effective and environmentally sustainable mode. And the reason for this gap is the non-availability of adequate infrastructure to enable a seamless shift. The Government has plans to develop the infrastructure across the country to implement that. To corroborate with a fact, on Indian roads, the average speed of freight vehicles ranges from 25 to 30 km per hour, which is 50 to 60% lower than the US. Consequently, this significantly contributes to the per ton per km (ptpk) cost. Prior to 2015, the road freight cost in India, adjusted for purchasing power parity, was INR 1.9 ptpk, which is double the cost in the US. The higher logistics costs in India can primarily be attributed to five key factors — unfavourable inter-modal mix, inefficient fleet mix, underdeveloped material handling infrastructure, underdeveloped road infrastructure, and procedural complexities. These factors are being addressed through key policy initiatives outlined in the national logistics policy by setting up 35 multi modal logistics parks across the country dovetailed with the infrastructure upgrades under the Sagarmala and Bharatmala Pariyojana of the Government of India.

The development of these modern logistics parks, MMLPs as these are referred to, is led by the Ministry of Road Transport and Highways of India (MoRTH) through the assistance of a central entity called the National Highways Logistics Management Ltd (NHLML). NHLML is collaborating with the inland waterways authority of India (IWAI) and the Rail Vikas Nigam Limited (RVNL) by signing a Tripartite agreement. The objective of this agreement is to expedite the establishment of state-of-the-art MMLPs nationwide as part of the Bharatmala Pariyojana project.

Most MMLPs currently consist of two transportation modes — roadways and railways. In the future, it is pertinent to contemplate partnerships with organisations such as the Airports Authority of India (AAI), Inland Waterways Authority of India (IWAI), and Indian Ports Association (IPA) with increasing scale of these parks to achieve significant reductions in logistics costs and promote sustainable transport alternatives.

MMLPs enable seamless inter-modal freight/cargo movement and offer multiple functional benefits and services. Further to achieve the scale of economies and sizeable development, following are pre-requisites to set up a multi-modal logistics park as on date:

01 **Minimum area of 100 acres**

02 **Higher cargo volumes**

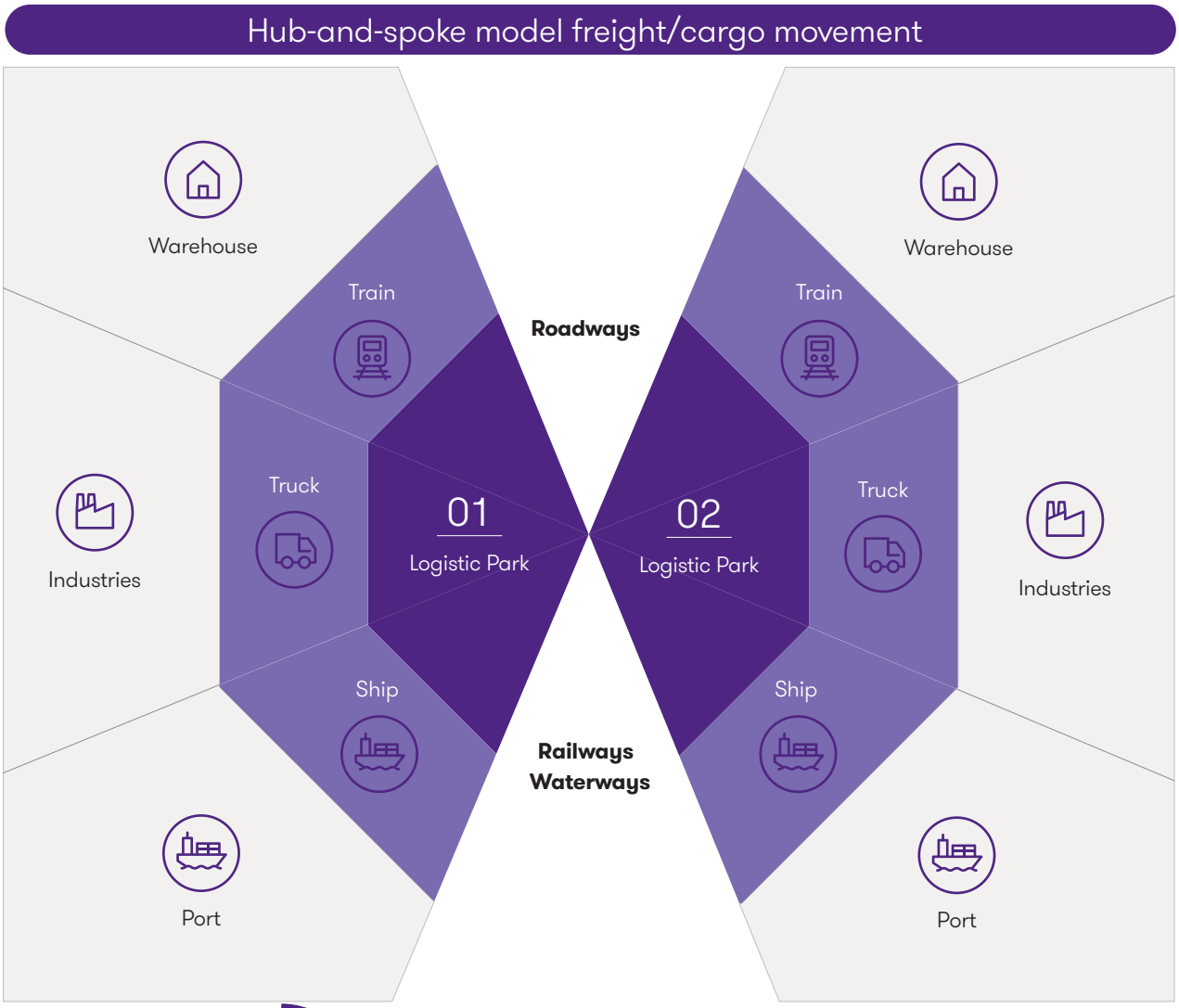
03 **Rail, port/airport connectivity**

04 **Logistics services like aggregation, processing, assembling, storage and distribution**



MMLPs facilitates a shift from point-to-point to a more efficient hub-and-spoke model of freight movement

Integrated Logistics Model (facilitated by MMLP)



Functionalities	Freight aggregation & distribution	Multi-model freight movement
Service offered	Storage and warehouse solutions	Value-added services (custom clearance, etc.)
Impact envisaged	Logistics cost	Carbon footprint

Expected benefits and costs

Benefits

Logistics parks drive reduction in overall freight cost by enabling freight transportation on big-sized trucks and rail. In addition, logistics parks enable reduction in vehicular pollution and congestion in key cities. These MMLPs are targeted to reduce logistics costs to less than 10% of the gross domestic product (GDP) and hence planned on the highest freight movement regions in the country. Logistics parks are expected to provide following key benefits as summarised below:



Challenges for India's cold chain market

By facilitating the movement of freight using larger trucks and rail, logistics parks are expected to contribute to a reduction of approximately 10% in transportation costs for the top 15 nodes. Larger sized trucks, in particular, have a significantly lower per ton per km freight cost, approximately 60% lower compared to smaller trucks. Additionally, enabling a seamless shift from road to rail, rail freight costs are approximately 45% lower per ton per kilometer compared to the average road freight cost.



Pollution reduction:

The utilisation of larger trucks and rail for increased freight transportation is expected to lead to a reduction of approximately 12% in CO2 emissions for the top 15 nodes. This reduction is attributed to the lower fuel consumption per ton per km of larger vehicles, resulting in decreased CO2 emissions. Furthermore, when compared to road freight, rail freight has approximately 65% lower CO2 emissions per ton per km. Similarly, there will be a corresponding decrease in PM (particulate matter), CO (carbon monoxide), and HC+NOx (hydrocarbons and nitrogen oxides) emissions due to the increased use of larger vehicles and rail for freight movement



Congestion reduction

The increased movement of freight using larger trucks and rail is expected to lead to a reduction of approximately 20% in the number of freight vehicles serving the needs of the top 15 nodes. Furthermore, relocating warehouses and wholesale markets, which are currently situated within urban areas, to logistics parks would free up space in cities and contribute to the reduction of congestion.



Cost reduction of warehousing

Relocating warehouses that are currently operating within city limits to logistics parks situated outside city boundaries is likely to result in a decrease in warehousing costs. This cost reduction is primarily driven by reduced rentals offered by logistics parks located outside urban areas. Additionally, the provision of modern and mechanised storage solutions by logistics parks will enable a reduction in storage and handling losses.

Among the 35 modern MMLPs sanctioned for implementation, Gujarat has the highest number with five MMLPs, followed by Maharashtra with four, Punjab with three, and Andhra Pradesh, Haryana, Madhya Pradesh, Odisha, Rajasthan, and Tamil Nadu each having two. Additionally, one MMLP each has been approved for Assam, Bihar, Chhattisgarh, Goa, Himachal Pradesh, Karnataka, Kerala, Telangana, West Bengal and the UTs of Delhi and Jammu and Kashmir. The parks are to be developed enabling seamless public private partnership (PPP) with models on land ownership with government or with private players based on need. The JVs/SPVs models can be planned accordingly with clear demarcations of private and public sector roles.

Land ownership with government.

JV Between NHLML and state

Role and responsibilities of JV (acquisition of land), trunk infrastructure and external infrastructure to the site, formulation of SPV (master developer/private partnership)

Funding- exploring self-sustainable options (equity/debt)

Land ownership with private players

SPV between NHLML and owner and/or state government

Role and responsibilities

NHLML and/or state government (trunk infrastructure and external infrastructure to the site)

Landowner (equity investment/land ownership)

"

The concept of Multimodal Logistics Park is gaining traction in the industry, wherein these parks are designed to handle extensive logistics needs and to improve efficiency of freight movement and distribution across the country. These parks will offer various advantages like improved efficiency through integrating various mediums and means of Transportation to reduce overall logistics cost, to increase connectivity between manufacturer & consumer. Further these parks will reduce congestion and increase economies of scale as they are strategically located. Government and private investors are increasingly recognizing the benefits of investing in such infrastructure to address the current and ever-increasing challenges on modern freight movement.

Need for these Multimodal Parks are driven by the E-commerce Boom, Need for Green Logistics, and increase in Collaborative Partnership. Collaboration between the Government and Industry is leading to a better risk management, and increased efficiency in the Warehousing and Logistics Sector driven by Multimodal Transportation and Freight Management.

Capitalizing on these trends and opportunities requires agility, adaptability, and commitment. As Indian Warehousing and Logistics Sector embraces technology, sustainability, and customer centricity, it is likely to thrive in an evolving and competitive world market.

"



Mr. Amit Kant
Sr. VP – Centre of Excellence
Allcargo Supply Chain

Proposed locations of MMLPs



Status

- MMLPs awarded
- MMLPs detailed feasibility report in progress
- MMLPs in its initial stage
- MMLPs planned for award in FY24

This map is for general illustration only and is not intended to be used for reference purposes.

06

Standardised warehouse practices



Standardised warehouse practices are essential to enhance logistics performance and establish resilient supply chains. The Department for Promotion of Industry and Internal Trade has introduced an e-book on warehousing standards. The e-book is a valuable guide for facility developers and regulatory agencies, facilitating the implementation of sector-specific standards and ensuring compliance with regulations.

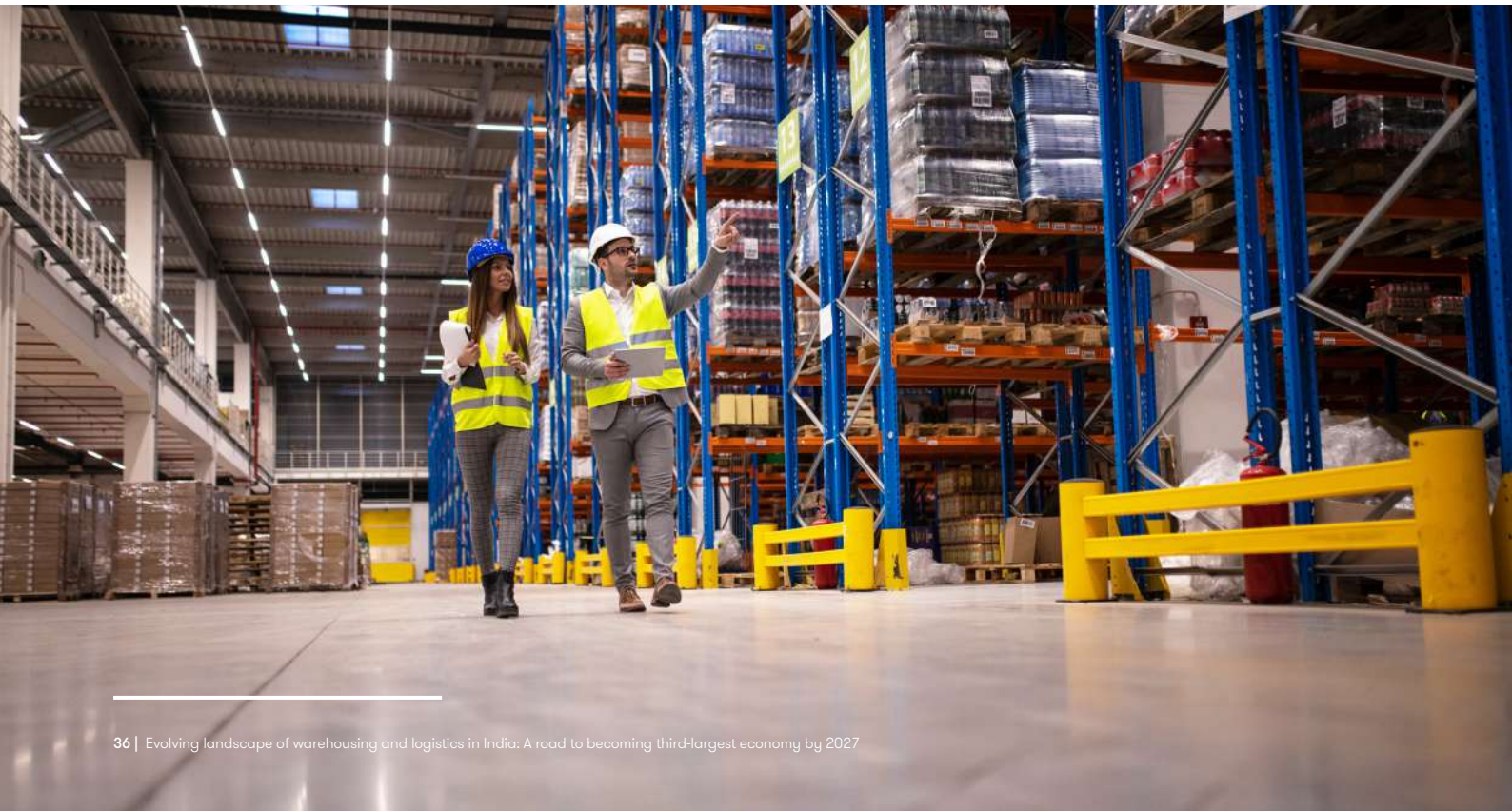
Standards covered are:

- **Standards for warehousing construction:** The guidelines introduce comprehensive standards for warehousing practices, including adherence to the National Building Code of India (NBC) for structural design and compliance with the Warehousing (Development and Regulation) Act. These standards aim to ensure the safety, integrity, and regulatory compliance of warehouses, promoting efficient and standardised operations within the industry.
- **Standards for palletisation:** The guidelines have introduced standards for palletisation to enhance efficiencies in warehousing and logistics operations. Standardising pallet sizes enables the standardisation of palletisers, racking systems, material handling equipment, truck load beds, and containers. This promotes better space utilisation, facilitates automation, reduces manual handling of goods, and improves overall productivity and work efficiency while minimising pallet losses and wastage. The guidelines emphasise the importance of selecting pallets based on factors such as stiffness, strength, size, durability, cleanliness, and weight. This also highlights the significance of accommodating standardised pallet dimensions in warehouse design to optimise workflow, enhance inventory movement, and generate significant cost savings for industries.
- **Standards for racking:** To ensure safe and efficient warehouse operations. These standards cover various aspects such as dimensions and clearances, design standards, raw materials, and standards for audit and maintenance. The guidelines specify the ideal rack beam length for matching pallet sizes and provide clearances for safe handling and operation. Design standards refer international standards for component design and load factors. The guidelines also emphasise the use of high-quality raw materials and recommend regular audit and maintenance activities to ensure the safety and integrity of the racking system. By implementing these standards, warehouses can enhance safety, optimise storage capacity, and improve overall warehouse efficiency.
- **Standards for material handling equipment:** These standards were introduced to ensure safe and efficient warehouse operations. They cover various aspects such as selection of the right MHE for the application, maintenance guidelines, and adherence to existing standards for MHE in India. The guidelines emphasise the importance of using MHE that comply with relevant government regulations and standards, such as those set by the Automotive Research Association of India (ARAI) and the Central Motor Vehicle Rules (CMVR). Additionally, the guidelines highlight the role of MHE in optimising warehouse productivity and achieving quick turnaround times. By implementing these standards, warehouses can enhance safety, improve operational throughput, and achieve higher productivity levels.
- **Standards for transportation:** These standards ensure efficient and safe movement of goods. They cover various aspects such as vehicle dimensions and design, network optimisation, vehicle turning radius, and daily truck check sheets. The guidelines emphasise the importance of adhering to existing standards for transportation infrastructure in the country, such as those prescribed by nodal agencies and the Central Motor Vehicle Rules (CMVR). Additionally, the guidelines highlight the need for network optimisation practices and the consideration of vehicle turning radius in warehouse design. Implementing these standards can enhance safety, improve logistics performance, and optimise transportation operations in warehouses.
- **Product-specific standards:** These standards ensure the quality and integrity of stored goods. They cover various aspects such as grading, sampling and testing, weights, and assaying standards for different types of products. The guidelines emphasise the importance of adhering to existing standards prescribed by regulatory authorities such as the Bureau of Indian Standards (BIS) and the Warehousing Development and Regulatory Authority (WDRA). By implementing these standards, warehouses can ensure consistent quality standards for different types of products, enhancing customer satisfaction and facilitating trade.

Recent technology trends: Warehouse automation and AI have been introduced in the new Warehouse Standardisation guidelines. These trends include the adoption of robotics and robotics as a service (RAAS) for various tasks within the warehouse, such as autonomous forklift systems, picking systems, and heavy carrier systems. AI-powered solutions, such as intelligent label and barcode scanning, have also been highlighted as high-value opportunities for warehouse automation. Other trends include the use of drones or automated guided vehicles (AGVs) for inventory management, the implementation of machine vision and sensor-powered systems for warehouse safety, and the application of AI and machine vision for intelligent sorting and human activity tracking. These trends reflect the growing importance of automation and AI in optimising warehouse operations, improving efficiency, and enhancing safety standards.

The implementation of warehouse standardisation guidelines can have several positive impacts on efficiency and turnaround time if the guidelines are followed. These impacts include:

- **Increased logistics performance:** By using standard sizes, systems and procedures, warehouses can achieve performance improvements and enhance overall logistics performance.
- **Reduction in logistics cost:** Standardisation practices such as mechanisation, automation, and network optimisation can lead to a reduction in logistics costs.
- **Improved inventory management:** Automation and AI-powered solutions can enhance inventory visibility and accuracy, reducing errors and improving overall inventory management.
- **Enhanced safety standards:** Warehouse standardisation guidelines emphasise safety measures such as vehicle turning radius considerations, warehouse safety applications, and the use of machine vision for collision avoidance, leading to improved safety standards.
- **Streamlined processes:** Standardisation of product-specific requirements, such as grading, sampling, and testing, can ensure consistent quality standards and streamline processes.
- **Optimal space utilisation:** Guidelines for palletisation and arrangement patterns of pallets in vehicles can maximise space utilisation and facilitate easy access to pallets, leading to efficient warehouse operations.
- **Faster order processing:** Automation and AI-powered solutions can automate and augment picking, put-away, and replenishment operations, reducing turnaround time and improving order processing speed.





"The target of increasing India's share in Global trade is laid out with phase-wise milestones. 3% of global share by 2027 and then to 10% by 2047. This can only be achieved by a resilient supply chain network which can sustain itself with changing market dynamics, pandemic, natural disasters, and other such disruptions which will require realignment in the strategy. Warehousing and Cold Chain remains the backbone of the Logistics Ecosystem. Collective effort is being taken to improve the modal connectivity to the distribution centres. Significant improvement of India's ranking in the Logistics Performance Index (World Bank) from 44th in 2018 to 38th in 2023 is testimony to the collective efforts made in that regard.

Since, my association have been with the Railways and the Ports all along my career, I acutely felt the need for containerization and standardized warehousing in India. The ease of inter-modal transportation provided by containerization and the availability of storage space in proximity to trading hubs shall ensure an improvement in the Container Availability Index at major ports.

The optimal utilization of resources can be key to mitigate the volatility in the Indian and Global Markets. The availability of reliable data and its utilization for Supply Chain optimizations provides an opportunity for Industry to leverage upon the Logistics Ecosystem already under development.

Change is a never-ending process, which reward agile players, those who adapt quickly emerge as the winners. The regulatory, operational, and institutional efforts have already provided the blueprint on which the physical infrastructure can be built for realizing the India's grand vision in Trade and Logistics."

Mr. Nandeesh Shukla
Dy. Chairman
Deendayal Port Authority

07

Green logistics interventions



The Indian warehousing and supply chain logistics sector is witnessing growing trend on environment friendly practices highlighting the importance of implementing green initiatives, emphasising their potential to minimise environmental impact, optimise resource utilisation and foster sustainability.

Taking a significant step towards promoting sustainability in the logistics industry, the Indian Green Building Council has introduced the IGBC Green Logistics Parks & Warehouses Rating System, focusing on the three pillars of sustainability — social, environmental and economic. This rating system provides concrete and abstract benefits to logistics parks and warehousing projects, encouraging the adoption of sustainable practices. By implementing green initiatives, warehouses and supply chain logistics can achieve various advantages such as energy savings, water conservation, reduced greenhouse gas emissions, streamlined operations, and increased productivity.

Three key initiatives that can enhance the sustainable warehousing and logistics ecosystem include the implementation of energy-efficient warehouses, the adoption of sustainable packaging practices, and the promotion of green transportation.

Energy efficiency:

Energy efficiency is a crucial component of green initiatives in warehousing and supply chain logistics. Warehouses can minimise their environmental impact and carbon emissions by embracing following energy-saving practices.

- **Solar panels:** Warehouse owners can significantly lower their carbon footprint and reduce reliance on traditional energy by installing solar panels on the wide, flat roofs, enabling them to meet up to 20% of their electricity requirements from rooftop solar power.
- **High-efficiency lighting:** Adopting energy-efficient solutions such as LED lights can yield substantial savings, as they use up to 90%[15] less energy compared to traditional industrial lighting and have an increased lifespan, reducing maintenance expenses.
- **Roof insulation:** Warehouse energy efficiency can be enhanced with proper roof insulation, as it reduces the demand for excessive heating or cooling. Well-insulated roofs maintain stable temperatures, easing the workload on HVAC systems and minimising energy usage. Besides lowering carbon emissions, this approach leads to reduced maintenance and repair costs associated with HVAC systems.
- **Rainwater harvesting:** Rainwater harvesting systems in warehouses help conserve water resources and reduce reliance on other sources. Capturing and storing rainwater for non-potable uses such as landscaping and flushing can significantly reduce water consumption and associated costs. This practice is particularly effective in refrigerated warehousing facilities, where water conservation measures contribute to overall sustainability.

Sustainable packaging:

The **Indian packaging market was valued at USD 50.5 billion in 2019 and is projected to reach USD 204.81 billion by 2025,** with a CAGR of 26.7% from 2020-2025[16]. **Over the last decade, packaging consumption in India has doubled, increasing from 4.3 kilograms per person per annum (PPPA) to 8.6 kg PPPA**[17], as reported by the Indian Institute of Packaging (IIP). Sustainable packaging is a crucial aspect of reducing waste generation and minimising the environmental impact of warehousing and supply chain logistics.

Implementing sustainable packaging practices involves several key considerations:

- **Source reduction:** Encouraging manufacturers and suppliers to adopt source reduction strategies helps minimise packaging waste. This includes optimising product sizes and using minimal packaging materials without compromising safety and integrity.
- **Reusable containers:** Promoting the use of returnable pallets and containers reduces reliance on single-use packaging. Establishing a well-organised system for retrieving and reusing these containers through reverse logistics enhances sustainability and waste reduction.
- **Biodegradable and compostable material:** Embracing biodegradable and compostable packaging material, such as bio-based plastics and natural fibre-based products, reduces the environmental impact of packaging. These materials are designed to break down easily, contributing to a circular economy and reducing their presence in landfills.

- **Eco-friendly cushioning and wrapping:** Seeking alternatives to traditional packaging material like bubble wrap and foam peanuts significantly reduces waste. Opting for eco-friendly options such as recycled paper, biodegradable air pillows, and moulded pulp packaging minimises environmental impact while ensuring the safety and protection of goods during transit.
- **Collaborative optimisation:** Collaborating with suppliers, distributors, and retailers to optimise packaging throughout the supply chain leads to substantial material usage reductions and waste reduction. By working together to right-size packaging, eliminate unnecessary layers, and improve logistics efficiency, stakeholders collectively contribute to sustainable packaging practices.

Reusable Packaging Association (RPA) estimates reusable packaging can reduce supply chain environmental impact in the following ways:

- **Less solid waste:** Switching to reusable packaging significantly reduces solid waste, eliminating hundreds of single-use items and resulting in up to an 86% reduction in landfill waste.
- **Lower CO2 emissions:** By adopting reusable packaging solutions, the need for recycling or remanufacturing is eliminated, leading to up to 60% decrease in CO2 emissions.
- **Lower energy consumption:** Reusable packaging requires up to 64% less energy to manufacture compared to single-use alternatives.
- **Lower water consumption:** Reusable packaging uses up to 80% less water throughout its lifecycle compared to single-use options.

Green transportation:

Incorporating green transportation practices within the supply chain is vital for reducing greenhouse gas emissions and air pollution. The use of low-emission vehicles, EVs, and alternative fuels can significantly contribute to sustainable transportation. EVs are gaining popularity in warehousing and distribution, as they minimise carbon emissions during pick-up, drop-off, loading, and unloading activities.

The Indian Government, particularly MoRTH, has taken several steps to promote green initiatives for transportation, including the supply chain sector. Some measures are:



- **Adoption of alternate fuels:** The Ministry has notified mass emission standards to introduce various alternate fuels such as ethanol-gasoline blends (E-10, E-12, E-15, E-20), flex-fuel (E-85 or E-100), ethanol blend for diesel vehicles (ED-95), biodiesel, bio-CNG, liquefied natural gas (LNG), methanol (M15 or M100), methanol MD (Managing Director) 95, dual fuel, M85, di-methyl ether (DME or D100), hydrogen fuel cell vehicles, and hydrogen CNG (Compressed Natural Gas). These fuels aim to reduce carbon emissions and promote eco-friendly transportation. Ethanol blending in Indian gasoline significantly reduces emissions, making it a greener fuel option for consumers. Studies have shown that carbon monoxide (CO) emissions are 20% lower for E10 and up to 50% lower for E20 in two-wheelers, while hydrocarbon (HC) emissions are reduced by 20% for both blends[18].
- **Incentives for EVs:** MoRTH has issued various advisories and notifications to encourage the adoption of electric vehicles. This includes granting exemptions from permits to battery-operated and ethanol/methanol-fuelled transport vehicles, incentivising EVs for shared mobility and public transport operations and exempting battery-operated vehicles from certain fees related to registration. Additionally, an advisory was issued for the sale and registration of EVs without batteries, facilitating the growth of battery-swapping models. As per industry estimates in a year, just one electric car on the road can save an average of 1.5 million grams of CO2.
- **FAME India scheme:** The Ministry of Heavy Industries launched the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) Scheme. This initiative, implemented in two phases, aims to support the electrification of public and shared transportation. Phase-II of the scheme, currently underway, focuses on reducing dependence on fossil fuels and addressing vehicular emissions through financial support.
- **Mandatory fitness testing:** The Ministry has made fitness testing of motor vehicles mandatory through automated testing stations. Heavy goods vehicles, heavy passenger motor vehicles, medium goods vehicles, medium passenger motor vehicles, and light motor vehicles (transport) are required to undergo fitness testing as per specific timelines.





Within the ever-evolving terrain of the warehousing industry, the surge in demand for Grade A warehousing solutions has been remarkable. Leading companies from FMCG, FMCD, CDE, and auto ancillary sectors, along with increasing demand from Tier 2 and Tier 3 markets in India, are optimizing their supply chain networks, setting a new standard for operational excellence. Embracing technology, sustainability, and customer-centric solutions will be key to unlocking the full potential of the industry and meeting the demands of a rapidly changing business landscape.

Moreover, India's burgeoning warehousing sector is attracting global companies, enriching the industry's diversity, and fostering a collaborative environment of innovation. As hyperlocal delivery and dark warehouses expand, the future of warehousing holds immense promise, powered by AI-driven automation, robotics, and IoT advancements, redefining supply chain management.

The sector is witnessing increasing collaboration and partnerships between industry players. Warehousing facilities have increasingly adopted eco-friendly practices, driven by the need for environmental stewardship and regulatory requirements. Embracing sustainable solutions, such as energy-efficient lighting, water conservation measures, and green building practices, will become standard in the industry providing further space for innovation and growth.

Looking forward, the future of warehousing in India holds immense promise. With a progressive and innovative mindset, the warehousing sector is set to thrive in the coming years.



Mr. Manikandan Ramachandran
Chief Operating Officer
TVS Industrial and Logistics Park

08

Capacity building: Skilling in logistics for productive employment



With the advent of new technologies in the warehousing sector, upskilling programmes are essential to keep the workforce updated. Many organisations and training institutes have recognised this need and introduced upskilling programmes focused on emerging technologies such as robotics, artificial intelligence, and data analytics in warehousing operations. These programmes help existing professionals to acquire necessary skills to adapt to technological advancements, ensuring the industry remains competitive and efficient.

- **Training and certification programmes:** In India, there are several training and certification programmes that have been implemented to enhance skill development in the warehousing industry. One notable initiative is the collaboration between the **National Institute of Open Schooling (NIOS) and the Logistics Sector Skill Council (LSC). NIOS,** an autonomous body under the Ministry of Education, has signed a Memorandum of Understanding (MoU) with LSC, which is established by the Ministry of Skill Development and Entrepreneurship. The objective of this partnership is to develop and **offer five courses at the secondary and senior secondary levels, focusing on logistics, supply chain management,** warehousing principles, inventory management, transportation, and warehouse management. These courses will be certified by NIOS. NIOS specialises in providing education through Open and Distance Learning (ODL), serving a wide range of learners, such as girls, women, rural youth, working professionals, SC (Supreme Court) and ST communities, and disadvantaged individuals who faced barriers to continuing their education. On the other hand, LSC functions as a Logistics Centre of Excellence with a mission to enhance and upskill the Indian workforce, in line with the Government's Skill India initiative. Through the collaboration between NIOS and LSC, it is expected that Indian individuals will receive training in various industry-related jobs, contributing to the creation of a skilled and empowered workforce through training courses and schemes. Additionally, **a new feature called the Bharat skills Forum** has been incorporated into the Bharat skills learning platform, developed by the Directorate General of Training (DGT) under the Ministry of Skill Development and Entrepreneurship. This platform acts as a digital warehouse for the skilling community, enabling the sharing of books, notes, videos, question banks and other skill-related content The Ministry of Skill Development and Entrepreneurship introduced the Pradhan Mantri Kaushal Vikas Yojana (PMKVY), aimed at offering targeted training programmes for individuals aspiring to work in the warehousing sector. These courses cover essential topics, including inventory management, logistics, material handling and safety protocols. The programme aims to offer industry-relevant training to unemployed youth, improving their employability in the warehousing sector.

- **Industry-academia collaboration:** Collaboration between the warehousing industry and academia plays a crucial role in skill development. Several efforts have been made to narrow the divide between theoretical knowledge and practical skills essential in the warehousing sector. These efforts include development of logistics and supply chain management institutes in partnership with industry stakeholders. These institutes can provide tailored courses and training programmes, developed in consultation with industry experts, to ensure that students are equipped with relevant skills to meet the evolving demands of the warehousing industry.

- **Regional skill development initiatives:** At the local and regional level, various state governments in India have launched regional skill development initiatives to promote skill development in warehousing. **For example, the Government of Maharashtra has established the Maharashtra State Skill Development Society (MSSDS) to enhance the employability of the state's workforce.**

09

Growing private sector participation: Investment trends



The logistics sector has been granted infrastructure status in 2017 by the Government of India and permitted 100% FDI. The grant of infrastructure status made infrastructure lending at easy terms with enhanced limits, access to large amounts of funds such as external commercial borrowings (ECB) and access to longer tenure funds from insurance companies.

As a result, the inflow of investments in India's logistics and warehousing sector is growing on the backdrop of its strategic location, people and regulatory measures undertaken by the Government. Reflecting on the Indian real estate scenario in the country, in 2022, these two sectors received USD 1.8 billion in private equity (PE)/venture capitalist (VC) investments, representing a 29% increase YoY. The industry gathered investments worth USD 1 billion (INR 8,257 crore) at the beginning of 2022. The logistics and warehousing industries' quarterly average investment was around 1.3 times more in 2022 than it was in 2021 when it was USD 335.69 million (INR 2,755 crore). Over the last four years (2019–2022), the warehouse and logistics sector has received a total institutional investment of USD 5.4 billion, with 2022 accounting for a major 35% portion.

Among real estate sub-sectors, warehousing stood out as the second-biggest investment draw in 2021 and 2022 accounting for 27% and 31%, respectively. The year 2022, in particular, had a spectacular 44% YoY increase, primarily due to a USD 1 billion contract between Lodha Group, CDPO, and Bain Capital. During the four-year period 2019-2022, the western part of the country — led by Mumbai, Pune, and Becharji, (a tiny town in Gujarat) — witnessed the second-highest institutional investment in warehousing that accounts for 35% of total investment in the industry. This also demonstrates increased confidence that investors have in the country's Tier 2 cities.

Following are the major investments in this sector:

Investor	Partner/Developer	Location	Amount (in USD million)	Year
Blackstone	Hiranandani Green Base	Multiple cities	351	2019
Blackstone	All cargo Logistics & Industrial Parks	Multiple cities	53.5	2020
IndoSpace	KSH Infra	Pune	134.5	2021
InvestCorp Group	NDR Warehousing	Multiple cities	55	2022
CDPQ, Bain Capital	Lodha Group	Multiple cities	1,000	2022

(Federation of Indian Chamber of Commerce & Industry)

10

Digital enablement: Key technology interventions



Warehouse digitalisation is reshaping the logistics sector by incorporating cutting-edge technologies such as AI, IoT (Internet of Things), robotics, AR/VR and blockchain. Through the utilisation of data and technology, warehouses are revolutionising their operations to boost productivity, accuracy, and safety. Automation of tasks, data-driven decision-making, and immersive personnel training are now within reach. As per industry estimates, embracing these innovations warehouses aniticipate efficiency improvements of upto 20% , offering improved visibility and control over operations. As a result, companies can reduce costs, accelerate order processing, and elevate customer satisfaction levels.

Some key digitalisation processes and interventions commonly implemented in logistics and warehouses system are:



Real-time tracking and visibility

Real-time tracking of inventory and shipments, enables better visibility throughout the supply chain. This ensures that inventory levels are accurate and that customers can receive timely updates on their orders.

In this regard, the Unified Logistics Interface Platform (ULIP), an innovative initiative, has been launched under NLP. It will feature over 100 APIs, encompassing more than 1600 data fields, initiated under NLP.



Automation and robotics

Robotics and automation, including autonomous mobile robots (AMRs) and automated storage and retrieval systems (AS/RS), are transforming warehousing.

Robo Business Report on Warehousing Automation suggests increased use of robotics has the potential to drive a 25–30% reduction in average manufacturing costs predominantly through savings in labour costs.



Data analytics and artificial intelligence

By analysing data from WMS, IoT devices, and customer orders, AI-powered systems can optimise warehouse layouts, predict demand and optimise inventory levels. These insights lead to better decision-making and resource allocation.



Barcode and RFID technology

Barcode and RFID integration in supply chains provides real-time product insights, reduces labour, saves time and enhances data accuracy by automating processes, leading to increased productivity.

A report from Cybra Corporation suggests that, on average, companies which adopt RFID see the inventory count accuracy go up from 63% to 95%.



Automated guided vehicles (AGVs)

AGVs in warehouses offer increased safety, accuracy and efficiency through sensor-guided autonomous movement, reducing manual labour and human errors in material handling and transportation processes.

A case study done in the simulated environment at AUTOLIV, Thailand, revealed that the AGV achieved a unit throughput that was 20% to 22.5% more efficient than manual material handling.



Augmented reality (AR) virtual reality (VR)

AR in warehouses and logistics can provide real-time information to workers through smart glasses and mobile apps, optimising order picking, improving inventory management, and enabling remote support and training. VR allows managers to create virtual simulations for layout planning and enhances employee training, fostering collaboration among teams for improved warehouse efficiency and decision-making.

DHL utilised wearable AR technology in one of their warehouses, resulting in a 25% increase in picking efficiency and cost reduction.



Warehousing forms a key link in the Supply chain to ensure better customer reach & service levels thus forming an integral part for the last mile customer reach. With focus on the infrastructure upgradation both on the Roadways & Railways, strategic warehousing locations and logistics parks shall ensure smooth & efficient change-over promoting use of multi modal infrastructure. Moreover, the rapid advancement of digital technologies supports Logistics service providers (LSPs) to adopt digital interventions like Inventory management systems, warehouse automation, real-time monitoring through Warehouse Management System, Automated Picking Tools, Automated Guided Vehicles (AGV), Automated Storage and Retrieval Systems (ASRS) etc. With these upcoming technological trends, distribution centres are becoming more efficient and effective meeting cost, service and delivery expectations.

Mr. Arun Salvi
Head Supply Chain - PetChem
Reliance Industries Limited



As the Warehousing sector in India continues to grow exponentially, there is a clear need to enhance warehouse operations with twin focus on Safety and Efficiency. It is in the context of these 'needs' that the Automated Storage and Retrieval Technologies (ASRT) and Green logistics will form the basis of future progress in the sector.

The Warehouses of the Future will primarily revolve around "Sensors" - Humans and Machines are becoming increasingly intertwined in intralogistics High tech Automated Guided Vehicles (AGVs) increasingly have "eyes and ears," enabling them to respond more effectively to what's happening around them. Combined with AI, Cloud technology and Real-time Communication (5G), a new kind of Phygital infrastructure is emerging in the warehouses space.

Secondly the Focus on Net Zero In the context of Supply Chains is one of the most pressing issues in the industry as the nation transitions into a Zero Emission Economy. Green MHEs (Material Handling Equipment) in Manufacturing operations & Warehouses can be a potential low hanging fruit for immediate execution for organization's ESG Strategy. The current opportunity to Lease (Opex) or Purchase (Capex) assets such as Forklifts, Reach Trucks, Battery Operated Pallet Trucks, VNAs etc. from MHE industry is an agile and scalable solution to the industries Zero Emission needs.

Mr. Varun Chopra
Executive Chairman
Gemini Equipment And Rentals Pvt. Ltd.

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Road ahead



This Knowledge Report focuses on the significance of logistics within the broader context of supply chain management. It is essential to recognise that supply chain management involves a wide range of activities, including planning, material sourcing, labour and facility management, as well as the production and delivery of goods and services. The Knowledge Report specifically discussed logistics and its interconnected activities in relation to the interests of the public sector and potential opportunities for public-private partnerships. The primary goal is to understand the social and economic impact and benefits that can be achieved within the sector.

The increasing dominance of 3PL in the warehousing and logistics sector indicates a clear trend where businesses are opting to outsource these functions to 3PL players. This trend is expected to continue in the future, especially for small and medium-scale businesses, as they seek to sustain their operations. The shift towards outsourcing is driven by the desire to focus on core activities and the limited availability of space in urban areas. By outsourcing, businesses gain the advantage of flexibility in choosing the location and cost-effectiveness of their operations. Moreover, it allows them to scale their workforce according to their core business needs.

Given India's diverse geography and multiple ethnicities, outsourcing to local 3PL agencies becomes crucial, especially when operating in challenging regions such as Himalayan states or sensitive areas. Local 3PL agencies can ensure better penetration of business routes in these regions. Large-scale e-commerce companies are also adopting similar strategies to cover the entire country and capitalise on the holistic market opportunities available in terms of coverage.

The constantly evolving technology landscape plays a crucial role in influencing decisions within the warehousing and logistics sector, whether it is about outsourcing work to 3PL providers or optimising logistics management. Opting for outsourcing also opens a wide range of technological possibilities, such as real-time tracking of commodities/ goods movement, inventory management, trend analysis, and forecasting future business needs. The section on digital enablement explores the various technologies utilised in the warehousing and logistics industry and how they impact decision-making on the demand side of businesses. Meanwhile, at a global level, both central and state governments are actively working on establishing a structured regulatory framework for the logistics supply chain.

The market for goods and services in Tier 1 cities and metropolitan areas is becoming oversaturated due to intense competition and an increasing demand for high-quality service delivery. Consequently, profit margins have significantly reduced, and some businesses resort to unhealthy practices of undercutting their competitors.

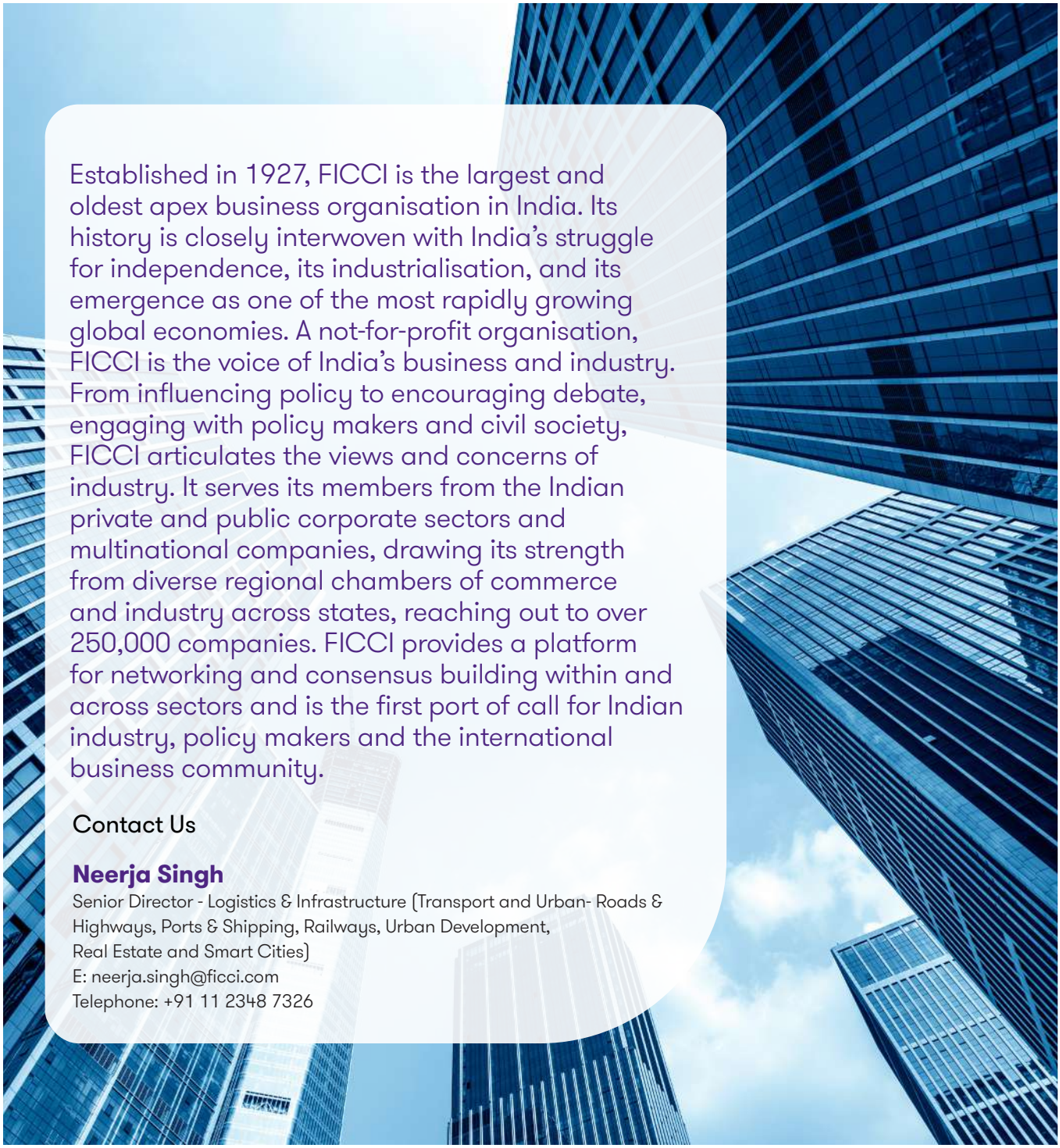
Furthermore, the advent of e-commerce, especially after the pandemic, has completely transformed consumer retail and shopping behaviours. This shift has also affected the development of Tier 2 and 3 cities and rural areas surrounding Tier 1 cities and metropolitan regions. However, the logistics infrastructure and formal supply chains in these areas are still in the process of evolving and improving and has strong potential to contribute to growth.

Given these challenges in Tier 1 cities, there is a growing realisation that the untapped potential lies in Tier 2 cities for the warehousing and logistics sector. To facilitate this, the Government's policies are now emphasising infrastructure development and skill enhancement in the logistics and warehousing industry, acting as a driving force to attract investors looking to benefit early from the opportunities in these new markets.

Grade A warehouses will likely continue to see increased demand and multi-level warehouses are likely to be the future to address the compulsions of faster e-commerce growth with technology-enabled features in urban areas enabling improved delivery time and reduced transportation costs.

Businesses will continue to invest in smart green solutions to reduce carbon footprint with technology adoption initiatives for energy optimisation, recycling packaging materials, recycling water, EVs and CNG vehicles for distribution.

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Glossary

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