

CONTAINERISATION
Transforming India's Maritime Trade

CONTAINERISATION RESHAPING INDIA'S MARITIME TRADE

Despite other modes of transportation, the maritime shipping mode is the backbone of international trade. The concept of containerisation has revolutionized cargo movement using standardised containers which transit easily from one ship to the other through railways and road transport.



Containerisation plays a crucial role in India's logistics landscape given the growing volumes of merchandise trade. According to the MoPSW, India's 95% of merchandise trade by volume happens via its maritime sector. There are 12 major ports and more than 200 non-major ports in the country. While the MoPSW oversees the management of major ports, non-major ports come under the control of the respective state maritime boards/State governments. These ports serve as hubs for a variety of cargo including crude oil, coal, container, fertilizers, agriculture, among others.

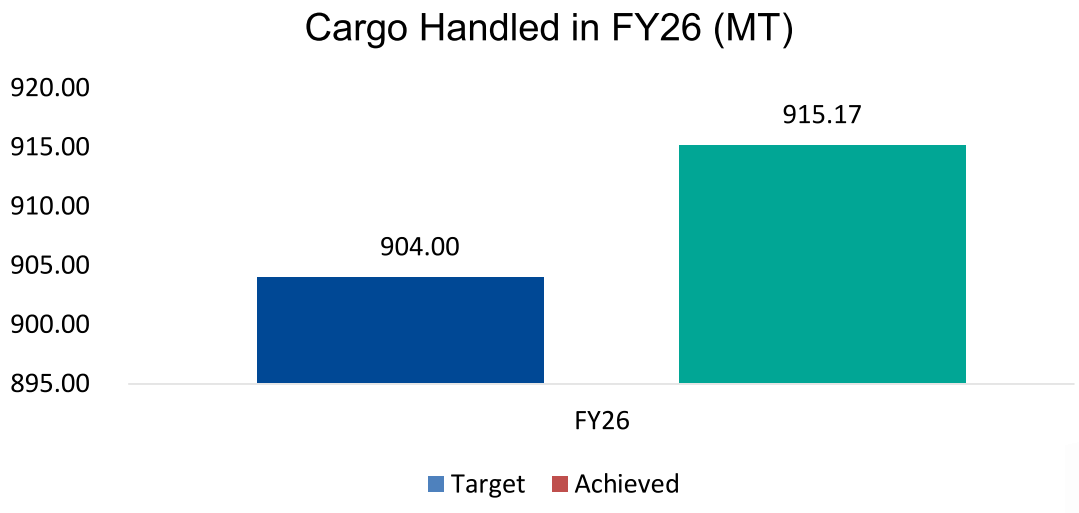
The government of India remains committed to the development of infrastructure through constant investment in public sector. As per the Union Budget FY27, capital expenditure has been increased to Rs. 12.20 lakh crore (US$ 135.56 billion). Indian maritime logistics infrastructure is being developed through the initiatives of the Sagarmala programme, PM GatiShakti National Master Plan, National Logistics Policy (NLP) and Maritime India Vision 2030. The Sagarmala programme that was launched in 2015 targets to reduce logistics cost of EXIM cargo through more than 800 identified projects for port modernisation and connectivity.

Containerisation is changing India's logistics value chain through the improvement of cargo movement via Inland Container Depots (ICDs), Container Freight Stations (CFSs), Multimodal Logistics Parks (MMLPs) and Dedicated Freight Corridors (DFCs). This integrated logistics value chain is making the country better integrated into the global value chain. The digital initiative of Port Community System (PCS 1x) along with Maritime Amrit Kaal Vision 2047 is expected to make logistics operations even more efficient.

As a result of all of these developments, India's major ports have handled an unprecedented 915.17 million tonnes



(MT) of cargo in FY26 beating the target of 904 MT for the year. Year-on-year increase in cargo handling was 7.06%. It happened thanks to the improved efficiency of port management, growth of trade volume, capacity addition and infrastructural modernisation at major ports. With the help of the strategic investments and policy changes made under Maritime Amrit Kaal Vision 2047, India's port sector remains instrumental in the development of multimodal logistics, international trade and position of the country as a global maritime hub.



EVOLUTION OF CONTAINERISATION IN INDIA

India's containerisation journey reflects the broader transformation of its maritime sector into an integrated, technology-enabled logistics ecosystem, and containerisation now forms the backbone of India's EXIM logistics.

Pre-1980: Conventional Cargo Handling and Limited Container Operations

Before containerisation, Indian ports primarily handled break-bulk cargo, manually loaded and unloaded, a labour-intensive process prone to damage and delay, with most ports lacking specialised container terminals and mechanised handling equipment.

The rapid growth of global container shipping in the 1960s and 1970s prompted India to adopt containerised cargo handling, with initial operations at Mumbai and Kolkata Port marking its transition towards modern maritime logistics.

1980-2000: Foundation of India's Container Logistics Ecosystem

The 1980s marked the start of organised container logistics in India, with the Container Corporation of India (CONCOR) in 1988, which developed Inland Container Depots (ICDs) and rail-based transport.

Another milestone was the commissioning of the Jawaharlal Nehru Port (JNPT) in 1989, India's first port built for container traffic, decongesting Mumbai Port and evolving into India's largest container port. These developments laid the foundation for dedicated container terminals, multimodal logistics and modern port operations.

2001-2014: Expansion through Private Participation and Modern Port Infrastructure

During the 2000s, India's containerisation ecosystem expanded rapidly through greater private participation under the Public-Private Partnership (PPP) model, with operators introducing advanced handling equipment and international best practices.

The period also witnessed the expansion of Container Freight Stations (CFSs) and Inland Container Depots, easing cargo evacuation to inland manufacturing centres, as export-oriented industries sharply increased demand for containerised cargo.



The integration of road, rail and port infrastructure during this period established the foundation for India's modern multimodal logistics network.

2015-2022: Port-Led Development under Sagarmala

A major shift in India's containerisation strategy began with the launch of the Sagarmala Programme in March 2015, adopting a comprehensive port-led development approach spanning port modernisation, connectivity, industrialisation and coastal shipping.

The programme aims to cut logistics costs through port capacity. As of March 2026, 845 projects worth Rs. 6.06 lakh crore (US$ 68.58 billion) had been identified, with 315 projects worth Rs. 1.57 lakh crore (US$ 17.77 billion) completed.

The programme also accelerated the adoption of mechanised cargo handling, digital port operations and integrated logistics planning, strengthening India's container logistics ecosystem.

2023-Present: Smart Ports, Digital Logistics and Global Transshipment

India's containerization policy is also in a new phase that focuses on digitalization and automation as well as international competitiveness with the implementation



of PM GatiShakti that links ports and industrial corridors for an efficient nationwide system.

The country is also making investments in next generation transshipment centers, like Vizhinjam Seaport in Kerala, and Vadhavan Port as well, thus decreasing India's dependency on foreign ports like Colombo, Singapore and Jebel Ali.

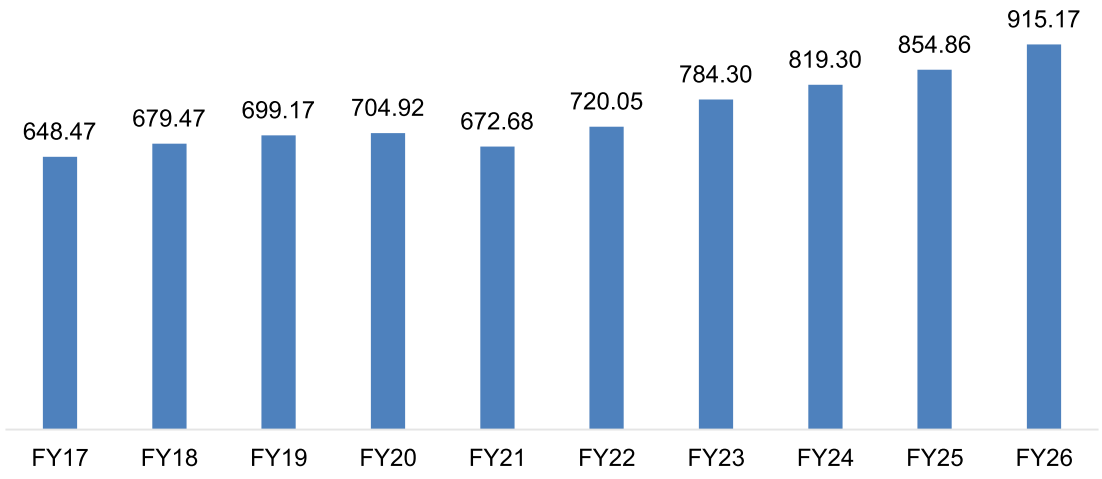
The impact of digitalization is also visible in the port activities, where PCS 1x, cargo management by AI, automation of terminals and blockchain documentation play their role.

This means that the development of containerization is not only related to the development of the port anymore but also covers logistics and digitalization.

EVOLUTION AT A GLANCE

PERIOD	KEY MILESTONE	STRATEGIC IMPACT
PRE-1980	Conventional break-bulk cargo handling	Limited efficiency, longer turnaround times
1980-2000	CONCOR established (1988), JNPT commissioned (1989)	Foundation of container logistics and ICD network
2001-2014	PPP-based container terminals, CFS expansion	Modernisation of container handling and multimodal logistics
2015-2022	Sagarmala Programme launched	Port-led development and logistics integration
2023-PRESENT	PM GatiShakti, National Logistics Portal (NLP), Vizhinjam, Vadhavan, smart ports	Digital, integrated and globally competitive container ecosystem

Cargo handled during FY17 to FY26 (in million tonnes)



India's major ports handled a record 915.17 million tonnes (MT) of cargo in FY26, increasing from 648.47 MT in FY17 despite a temporary decline in FY21. The consistent growth reflects sustained investments in port infrastructure, capacity expansion, improved operational efficiency, and increasing trade volumes.

POLICY FRAMEWORK DRIVING CONTAINERISATION IN INDIA

India's containerisation ecosystem has evolved through institutional reforms, infrastructure investment and policy initiatives, strengthening the container supply chain from ports and inland facilities to industrial corridors and export gateways.



Institutional Framework Supporting Containerisation

Ministry of Ports, Shipping and Waterways (MoPSW) is the top-tier policy-making organisation in relation to ports, shipping, and maritime logistics.

Operations management of the country's major ports is done by individual Port Authorities through the Major Port Authorities Act, 2021, which provides more flexibility and faster reaction to the evolving environment.

The Indian Ports Association (IPA) acts as the coordinating agency for India's major ports, advocating for good practices, digitisation, and operational benchmarking.

Directorate General of Shipping (DGS) regulates the operations of ships and ensures safety of shipping operations while adhering to international regulations and providing efficient shipping services.

Inland container transport is facilitated by Container Corporation of India (CONCOR), which provides a large network of ICDs and inland rail transport services connecting the manufacturing hubs to ports.

Sagarmala Programme: Revitalizing Port-Led Development

The Sagarmala Programme, approved in March 2015, is India's flagship port-led development program encompassing port modernization, connectivity, industrialization, and coastal shipping.

Up until March 2026, the program included 845 projects estimated at a value of about Rs. 6.06 lakh crore (US$ 68.58 billion), out of which 315 projects with an approximate value of Rs. 1.57 lakh crore (US$ 17.77 billion) were completed.

Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047

To boost India's competitive position in the global maritime trade network, the Government launched the Maritime India Vision 2030 plan. This roadmap is focused on port modernization, efficient logistics, ship-building and digitalisation.

As a continuation of the said roadmap, the Maritime Amrit Kaal Vision 2047 will serve as a long-term strategy to make India one of the leading countries in the global maritime trade network.

PM GatiShakti and National Logistics Policy

The PM GatiShakti National Master Plan, introduced in October 2021, marked the beginning of the integrated infrastructure development to help coordinate the development of ports, railways, highways and industrial corridors.

When it comes to container logistics, PM GatiShakti enables smooth connectivity of the ports, ICDs, DFCs, MMLPs and manufacturing clusters, thus overcoming logistical bottlenecks.

To complement this initiative, the National Logistics Policy (NLP), launched in September 2022, aims to enhance logistics efficiency due to digital integration and fast cargo clearance.

Digital Trade Facilitation and Port Modernisation

Today, digitalisation becomes essential for India's containerisation strategy. As a result, the Port Community System (PCS



1x) has become a single platform for exchanging the necessary information among shipping lines, customs agencies and ports.

In addition, the Government actively promotes the paperless documentation, e-delivery orders, RFID-based tracking systems and automated gate systems in order to improve terminal productivity and dwell time.

Financing and Private Sector Participation

Infrastructure development for container transport has largely relied on the Public-Private Partnership (PPP). The construction or expansion of major container terminals in JNPA, Mundra, Chennai and Pipavav has taken place with the involvement of private investors.

Complementing private sector participation, the Union Budget FY27 earmarked Rs. 12.20 lakh crore (US$ 135.56 billion) towards capital expenditure, with continued investments expected to enhance port connectivity and strengthen India's container logistics infrastructure.

CONTAINERISATION AS A DRIVER OF MARITIME TRADE AND LOGISTICS TRANSFORMATION

Containerisation has fundamentally transformed how goods are transported and distributed across global supply chains. In India, container-based logistics has improved maritime trade efficiency by cutting handling time and costs.

Enhancing Port Productivity and Operational Efficiency

Containerisation is a revolutionary change in the transportation and distribution of goods around the globe. In India, containerisation became a driver of logistics efficiency due to reduced handling time and costs.

One of the biggest achievements of containerisation has been enhanced port productivity. It has become possible due



to the use of specialized equipment and digitalisation in container terminals.

According to the data published by the Ministry of Ports, Shipping and Waterways (MoPSW), the average turnaround time (TRT) of vessels at India's major ports decreased from 96 hours in FY14 to approximately 49.5 hours in FY25.

Strengthening India's Export Competitiveness

Logistics efficiency became a crucial factor for export competitiveness, because efficient cargo movement allows exporters to deliver goods according to international schedule and save costs.

Containerisation has particularly benefited the following export-oriented industries:

- Engineering goods
- Automobiles
- Electronics
- Pharmaceuticals
- Textiles and apparel
- Chemicals
- Agricultural products

Integrating ports with DFCs, industrial corridors, ICDs and MMLPs is creating seamless freight networks connecting manufacturing clusters with international markets.

According to the National Logistics Policy, improving multimodal logistics and reducing cargo handling inefficiencies are critical to India's global trade competitiveness and export-led growth.

Multimodal Logistics Integration

Containerisation has enabled integrated multimodal transport systems, allowing containers to move seamlessly between ports, railways, highways and inland facilities without repacking.
India's multimodal logistics ecosystem now comprises:

- Inland Container Depots (ICDs)
- Container Freight Stations (CFSs)
- Dedicated Freight Corridors (DFCs)
- Multimodal Logistics Parks (MMLPs)
- Rail-linked container terminals
- Coastal shipping services

PM GatiShakti has further strengthened this ecosystem by integrating planning across ports, railways, highways and industrial corridors through a GIS-based platform, reducing bottlenecks.

Digitalisation Driving Trade Facilitation

Digital technologies are transforming India's container logistics ecosystem by improving transparency, reducing paperwork and accelerating cargo clearance.

The Port Community System (PCS 1x) has emerged as a single electronic platform connecting:

- Shipping lines
- Customs authorities
- Port terminals
- Freight forwarders
- Container operators
- Banks
- Logistics service providers



The platform facilitates paperless documentation, electronic delivery orders, online vessel scheduling and real-time cargo tracking, significantly improving operational efficiency.



The Government is also promoting:
- RFID-enabled container tracking
- Electronic Bills of Lading
- Blockchain-enabled documentation
- AI-based cargo analytics
- Automated gate operations

These technologies reduce administrative delays while improving supply chain visibility.

Containerisation Supporting Industrial Development

Containerisation has strengthened India's industrial competitiveness by improving connectivity between manufacturing clusters and export gateways.

Industrial corridors such as:
- Vizag-Chennai Industrial Corridor (VCIC)
- Chennai-Bengaluru Industrial Corridor (CBIC)
- Delhi-Mumbai Industrial Corridor (DMIC)

These corridors are increasingly integrated with container ports through dedicated road and rail infrastructure.

This integration enables manufacturers to:
- reduce inventory costs
- improve production planning
- shorten delivery cycles
- access international markets more efficiently

Container logistics has also spurred the growth of logistics parks, warehousing clusters and export-oriented industrial parks around major ports.

Improving India's Position in Global Supply Chains

Global manufacturers increasingly seek efficient logistics ecosystems capable of supporting reliable cargo movement and resilient supply chains.

Containerisation enables India to participate more effectively in global value chains by providing:
- predictable transit schedules
- lower cargo handling costs
- better port connectivity
- integrated logistics services
- faster customs clearance

India's focus on port development through Sagarmala and multi-modal connectivity through PM GatiShakti initiative is making the country more and more suitable for manufacturing and exports.

Economic Outlook

Containerization is developing from a purely cargo service to a logistics ecosystem that is instrumental in facilitating industrialization and exporting capabilities of India within its international shipping network.

Vizhinjam, Vadhavan Port, and future multi-modal logistics parks will facilitate increased connectivity between ports and industries, with containerization as an integral component of the future economic development strategy.



TABLE: Major Port-wise Monthly Cargo handled (in Tonnes)

S.No.	Major Port	June 2025 (P)	June 2026 (A)	April-June 2025-26 (P)	April-June 2026-27 (A)
1	SMP Kolkata	5,934,754	6,289,995	17,186,858	17,242,748
2	Paradip	13,142,121	12,951,576	39,244,562	39,665,597
3	Visakhapatnam	7,326,886	8,766,109	21,587,009	24,389,246
4	Kamarajar	4,105,298	4,299,999	11,788,443	12,776,429
5	Chennai	5,079,970	4,829,699	15,059,985	14,224,768
6	V.O. Chidambaranar	3,629,833	3,303,351	10,628,516	10,861,007
7	Cochin	3,398,458	3,026,544	9,407,718	8,691,233
8	New Mangalore	3,302,749	3,574,404	10,744,241	11,773,445
9	Mormugao	1,678,274	1,483,689	4,810,772	5,228,519
10	Mumbai	5,680,484	5,803,562	17,465,529	18,192,276
11	JNPA	7,556,081	8,667,376	24,200,112	27,839,498
12	Deendayal	12,032,798	16,731,186	37,913,085	42,756,094
Total	**All Major Ports**	**72,867,706**	**79,727,490**	**220,036,830**	**233,640,860**

Source: Ministry of Ports, Shipping and Waterways, P-Provisional, A- Advanced Estimates

MAJOR CONTAINER PORTS AND EMERGING MARITIME HUBS

Indian container port ecosystem has undergone change over the last three decades with the increase in trade, port modernisation and increased private sector involvement in the same with programs like Sagarmala, PM GatiShakti, and Maritime Vision contributing to increased handling capacity of the ports.



Jawaharlal Nehru Port Authority (JNPA): India's Largest Container Gateway

Situated at Nhava Sheva, Maharashtra, JNPA is the biggest Indian container port, handling almost 50% of India's containerized EXIM cargo, comprising of five terminals with direct access to the Western Dedicated Freight Corridor (WDFC). As per JNPA, the port had a record handling capacity of 7.3 million TEUs in FY25 and is working on expansion of capacity through Fourth Container Terminal and JNPA SEZ and Multimodal Logistics Park.

This is going to help JNPA establish itself as the biggest Indian container gateway along with improving the evacuation process and lowering the logistics cost.

Mundra Port: India's Largest Commercial Container Port

Mundra Port, which is located in Gujarat and managed by APSEZ, has grown to become India's largest commercial container port and one of the most rapidly growing ports in South Asia in terms of maritime logistics. The excellent geographical location, modern automated facilities, and connectivity through railways, highway connections, and Inland Container Depots (ICDs) have helped make the port an attractive hub for international shipping lines.

Chennai Port and Kamarajar Port: Southern India's Container Gateway

The Chennai Port is also one of the oldest container ports in India and an important exporting port for southern India, especially for automobiles, engineering goeconomiods, and electronics.





Apart from the Chennai port, Kamarajar Port (Ennore) in Tamil Nadu, which is the first corporatised major port in India, assists in handling containers along with automobiles, coal, and project cargo.

Along with Kattupalli Port, these ports act as a major maritime logistics cluster for the Chennai-Bengaluru Industrial Corridor (CBIC) and manufacturing industry of southern India.

Improvement in road and rail connectivity through PM GatiShakti will further help in strengthening container movements in the region.

Vizhinjam International Deepwater Port: India's Emerging Transshipment Hub

The Vizhinjam International Deep Water multi-purpose seaport in Kerala is considered to be among the most important projects for maritime infrastructure development in India. Designed under a public-private partnership structure, the project is expected to operate as an international transshipment hub.

Since the natural depth of the port is over 20 meters, it will allow accommodating Ultra Large Container Vessels without requiring additional dredging, which provides a strategic advantage over other regional ports.

A considerable part of India's transshipment cargo goes through foreign ports such as Colombo, Singapore, and Jebel Ali; Vizhinjam will help to decrease dependence on foreign ports and increase domestic transit.

Vadhavan Port: India's Next Mega Container Port

The newly approved Vadhavan Port project is expected to be the biggest deep water port in the world. In June 2024, the project was approved by the Union Cabinet. Vadhavan Port Project Limited (VPPL) is engaged in the construction of the project and represents a joint venture between the Jawaharlal Nehru Port Authority and Maharashtra Maritime Board. The port will be capable of



accommodating mega container vessels over 24,000 TEUs, which means that its capacity will significantly increase India's ability to handle container cargo.

Smart Ports and Container Terminal Modernisation

India's major container ports are increasingly adopting advanced technologies to improve operational efficiency and reduce vessel turnaround time.

Key initiatives include:

- Automated Ship-to-Shore (STS) cranes
- Rubber-Tyred Gantry (RTG) crane automation
- RFID-based container tracking
- Port Community System (PCS 1x)
- AI-enabled cargo planning
- IoT-based terminal monitoring
- Digital documentation
- Electronic Delivery Orders (eDO)

These technologies improve terminal productivity, reduce container dwell time and enhance supply chain visibility.



Table: Major Container Ports in India

Port	State	Strategic Role
Jawaharlal Nehru Port (JNPA)	Maharashtra	India's largest container gateway
Mundra Port	Gujarat	Largest private container port
Chennai Port	Tamil Nadu	Automobile & engineering exports
Kamarajar Port	Tamil Nadu	Integrated container & automobile logistics
Deendayal Port	Gujarat	Western India logistics hub
Vizhinjam Port	Kerala	International transshipment hub
Vadhavan Port	Maharashtra	Future mega deep-water container port

Award of Waterfront and Associated Land to Port Dependent Industries (PDI) in Major Ports

A new Waterfront Allocation Policy for Port Dependent Industries (PDI) in major ports has been formulated by the Union Cabinet, superseding the policy that was issued in 2016. The policy will enable existing captive users to augment their capacity by way of more berths, jetties, terminals and Single Buoy Mooring (SBM) and offer the facility of concession extension up to 30 years. Additionally, the policy also incorporates a competitive bidding system along with Right of First Refusal (RoFR) for augmentation of capacity and provision for direct allocation of waterfronts to eligible government agencies. Moreover, the policy will also have provisions of Change in Law and Unforeseen Events. These amendments to the previous policy are likely to invite private sector investments, increase cargo handling, improve the efficiency of utilization of waterfronts, and enhance the process of port led industrialization.



SECTORAL IMPACT OF CONTAINERISATION ON INDIA'S ECONOMY

Containerization in India has now developed from a mere means of maritime logistics into a key tool of growth of India's industry and trade by facilitating standardized multimodal transportation through ports, railways, road and inland ports.

Manufacturing: Enabling Export-Oriented Industrial Growth

Manufacturing is amongst the sectors which have gained most from containerization through efficient container logistics.

Manufacturing expansion is linked with logistics infrastructure under PM GatiShakti. According to the PIB (April 2026), manufacturing contributes around 16-17% of India's GDP and employs 27 million people, with a government target of 25% by 2047.

Containerisation is particularly important for export-oriented industries such as:

- Engineering goods
- Electronics
- Automobiles
- Pharmaceuticals
- Chemicals
- Textiles

whose competitiveness depends on reliable and time-bound cargo movement.

Automobile Industry: Supporting Global Vehicle Exports

India has emerged as one of the world's largest automobile manufacturing hubs, with exports of passenger vehicles, two-wheelers and auto components increasingly dependent on efficient container and Ro-Ro logistics.

The major ports such as JNPA, Chennai Port, Kamarajar Port, and Mundra Port offer container terminal facilities for exporting automobiles, which help the manufacturers comply with their deadlines in Europe, Africa, Latin America, and Southeast Asia. In addition, with the inclusion of CBIC and DMIC to the existing network, the export of automobiles from India has become more robust.

Pharmaceuticals and Healthcare

India is one of the leading nations when it comes to exporting generic medicines because the pharmaceutical industry exports products to more than 200 countries. The use of containers enables safe shipping and temperature control.

The development in the number of refrigerated containers, cold chain logistics, and facilities for handling containers has helped in the export of vaccines, biologics, and temperature-sensitive medicines. Union Budget 2026-27 introduced Biopharma SHAKTI with a total expenditure of Rs. 10,000 crore (US$ 1,132 million) within five years.

Agriculture, Food Processing and Cold Chain Logistics

The use of containers has led to the improvement in agricultural exportation, and reduced cargo loss and quality preservation have been achieved during transportation. Refrigerated containers and cold chain logistics have helped export:

- Fruits
- Vegetables
- Marine products
- Dairy products
- Processed foods
- Meat products

Containerised logistics has also supported the objectives of the Pradhan Mantri Kisan Sampada Yojana (PMKSY) by strengthening farm-to-port connectivity and reducing post-harvest losses.

The integration of container terminals with inland logistics hubs has improved access to international markets for agricultural exporters while enhancing food supply chain resilience.

Textiles, Apparel and Consumer Goods

India's textile and apparel industry relies extensively on container shipping given its export orientation, with containerisation enabling the efficient transportation of garments, home textiles, and technical textiles to global markets while minimising handling damage.

The continued development of PM MITRA (Prime Minister Mega Integrated Textile Region and Apparel) Parks, integrated textile clusters and improved port connectivity under PM GatiShakti is expected to strengthen India's textile export competitiveness by cutting logistics costs and improving delivery reliability.

E-commerce, Warehousing and Logistics

The rapid growth of India's e-commerce sector has increased demand for efficient container logistics, multimodal warehousing and integrated freight transportation.

Containerisation supports the movement of imported products, export consignments and domestic cargo through:

- Inland Container Depots (ICDs)
- Container Freight Stations (CFSs)
- Multimodal Logistics Parks (MMLPs)
- Rail-linked logistics hubs

According to the Comptroller and Auditor General (CAG), ICDs and CFSs function as "dry ports," providing customs clearance and storage closer to production centres, reducing seaport congestion.

MSMEs and Export Competitiveness

Containerisation has enhanced export opportunities for Micro, Small and Medium Enterprises (MSMEs) by providing access to integrated logistics networks and international shipping services.

According to the PIB, India has 7.47 crore MSMEs, accounting for 35.4% of manufacturing output, with improved port connectivity helping MSMEs participate



more effectively in export markets.

Sectoral Impact at a Glance

Sector	Contribution of Containerisation
Manufacturing	Faster exports, lower logistics costs, improved industrial competitiveness
Automobile	Efficient vehicle and component exports through integrated port logistics
Pharmaceuticals	Secure reefer logistics and global medicine exports
Agriculture	Cold-chain exports and reduced post-harvest losses
Textiles	Faster export shipments and improved supply chain efficiency
E-commerce & Logistics	ICDs, CFSs, warehousing and multimodal cargo movement
MSMEs	Improved export accessibility and logistics integration

FUTURE OUTLOOK – SMART PORTS, GREEN SHIPPING AND DIGITAL CONTAINER ECOSYSTEMS

India's containerisation ecosystem is entering a new phase defined by digital transformation, sustainability and multimodal logistics, supported by initiatives such as Maritime India Vision 2030, Maritime Amrit Kaal Vision 2047 and PM GatiShakti.

Digital Transformation of Container Ports

The future of container logistics will increasingly be driven by automation, AI and digital platforms, with major ports deploying automated cranes, RFID-enabled tracking, drone-based inspections and AI-assisted traffic management.

The Port Community System (PCS 1x) has emerged as the digital backbone of India's maritime trade ecosystem, integrating shipping lines, port authorities and customs on a single platform, reducing administrative delays.

Future investment is expected to focus on digital twins, Internet of Things (IoT) sensors to monitor terminal performance and optimise berth allocation.

Smart Ports and Automated Container Terminals

Automation is becoming a defining feature of next-generation container ports, with modern terminals increasingly relying on automated equipment to improve productivity and reduce turnaround time.

Key technologies expected to witness wider adoption include:

- Automated Ship-to-Shore (STS) cranes
- Automated Rubber Tyred Gantry (RTG) cranes
- Optical Character Recognition (OCR)-enabled gate systems
- AI-assisted yard planning
- Autonomous container handling equipment
- Remote terminal operations

These technologies enhance berth productivity, improve container handling accuracy and optimise asset utilisation, enabling ports to accommodate larger vessels and increasing cargo volumes.

The development of Vizhinjam International Deepwater Port and the

Vadhavan Port reflects India's long-term strategy to create globally competitive, technology-enabled container transshipment hubs.

Green Ports and Sustainable Shipping

Sustainability is becoming a central pillar of maritime infrastructure development as the global shipping industry seeks to reduce greenhouse gas emissions and transition towards cleaner energy sources.

India's Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047 promote Green Ports through energy-efficient infrastructure, renewable energy integration and responsible cargo handling.

Future container terminals are expected to incorporate:

- Shore-to-Ship Power (Cold Ironing)
- Solar-powered terminal operations
- Electrified cargo handling equipment
- Green building standards
- Water recycling systems
- Carbon monitoring platforms

These initiatives support India's broader commitment to achieving Net Zero by 2070 while improving the environmental sustainability of port operations.

Green Fuels and the National Green Hydrogen Mission

Decarbonising maritime transport is expected to become a major priority. Under the National Green Hydrogen Mission, India is promoting green hydrogen production and bunkering infrastructure to reduce dependence on fossil fuels.

Ports are expected to play an important role by developing hydrogen and green ammonia bunkering facilities, supporting the transition towards low-carbon maritime logistics.

Liquefied Natural Gas (LNG), methanol, biofuels and green hydrogen are expected to emerge as important alternative fuels for future container shipping.

Strengthening India's Position in Global Container Trade

India is strategically investing in transshipment infrastructure to reduce dependence on overseas hubs such as Colombo, Singapore and Jebel Ali.
Projects such as:

- Vizhinjam International Deepwater Port
- Vadhavan Port
- Dedicated Freight Corridors (DFCs)
- PM GatiShakti
- Multimodal Logistics Parks (MMLPs)

The above-mentioned projects are expected to significantly improve container evacuation, reduce logistics costs and strengthen India's integration into global shipping networks.

The continued expansion of industrial corridors and manufacturing hubs will further increase demand for containerised cargo movement, supporting India's ambition to emerge as a preferred destination for global supply chains.

Strategic Outlook

The future of containerisation in India extends beyond increasing throughput to creating an integrated, sustainable maritime logistics ecosystem, as automation, AI, blockchain and green shipping reshape container operations over the next two decades.

As India advances towards the Maritime Amrit Kaal Vision 2047, container ports are expected to become intelligent logistics hubs connected with industrial corridors and multimodal logistics parks, strengthening the sector's resilience.

Supported by continued infrastructure investment and policy reforms,

containerisation is expected to remain a key driver of India's export competitiveness and global trade integration.

Table: Future Trends in India's Containerisation Ecosystem

Emerging Trend	Expected Impact
AI & Port Automation	Faster cargo handling and improved terminal productivity
Port Community System (PCS 1x)	Paperless documentation and digital trade facilitation
Smart Ports	Automated equipment and digital asset management
Green Ports	Renewable energy, electrification and lower emissions
Green Hydrogen	Low-carbon marine fuels and bunkering infrastructure
PM GatiShakti	Multimodal logistics integration
Maritime Amrit Kaal Vision 2047	Long-term maritime competitiveness

CONCLUSION AND ROAD AHEAD

Containerisation has fundamentally transformed India's maritime trade by improving cargo handling efficiency and deepening integration into global supply chains, becoming a critical pillar of manufacturing and exports.
Government-led initiatives including the Sagarmala Programme, PM GatiShakti National Master Plan, National Logistics Policy (NLP) and the Maritime Vision programmes have accelerated an integrated maritime logistics ecosystem.

India's major container gateways-including Jawaharlal Nehru Port Authority (JNPA), Mundra Port, Chennai Port, Deendayal Port and emerging transshipment hubs such as Vizhinjam and Vadhavan Port are expected to play a growing role in container throughput.

Containerisation has also generated economic benefits beyond the port sector, strengthening export-oriented manufacturing, agricultural exports and pharmaceutical and automobile supply chains, and helping MSMEs access global markets.

Looking ahead, the future of India's maritime trade will depend on automation, AI and green shipping. Adopting Port Community System (PCS 1x) is expected to transform Indian ports into intelligent logistics hubs.

As India advances towards the Viksit Bharat 2047 vision, containerisation is expected to remain central to the country's maritime strategy, positioning India to emerge as a leading maritime logistics economy.

