



DAILY EDITORIAL ANALYSIS

TOPIC

**SMART WAREHOUSING: INDIA'S
UNIQUE WAREHOUSE ADVANTAGE**

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SMART WAREHOUSING: INDIA'S UNIQUE WAREHOUSE ADVANTAGE

Context

- India's rapid e-commerce and quick-commerce expansion is driving warehouse modernisation, making AI-led optimisation and selective automation crucial to improving speed, efficiency and logistics competitiveness.

Warehouse Sector & Current Status in India

- Warehousing is becoming a strategic component of India's logistics ecosystem rather than merely a storage activity.
- The expansion of e-commerce, organised retail, manufacturing and quick commerce has increased demand for strategically located, technology-enabled warehouses and urban **dark stores**.
- India's warehousing market has become more institutionalised, with increasing participation of organised developers and technology firms.
 - Automation is expanding through **Automated Storage and Retrieval Systems (ASRS), autonomous mobile robots (AMRs), conveyor systems, sortation and Warehouse Management Systems (WMS)**.

Key Advantages of India's Warehousing Model

- AI before heavy automation:** The biggest opportunity lies not necessarily in replacing workers with robots but in improving the decisions that workers and machines make.
 - AI can optimise picking sequences, storage locations, inventory allocation, demand forecasting and delivery routes.
 - AI-based dynamic picking reportedly improved on-time fulfilment from nearly **82% to about 98%** under heavy demand.
- Retrofitting existing infrastructure:** Software-led automation can be deployed in existing warehouses without rebuilding entire facilities.
 - It is particularly relevant for India, where capital costs are significant and warehouse infrastructure varies widely.
- Hybrid human-machine model:** India has abundant labour compared with advanced economies.
 - Therefore, a **human-plus-machine model** can be more economically viable: software can guide workers while robots undertake repetitive, high-volume activities.
- Better utilisation of space:** Automated storage systems can increase storage density, while intelligent inventory placement can reduce unnecessary movement and improve order turnaround.

Issues & Concerns

- Fragmented and uneven infrastructure:** A large part of India's warehousing capacity remains fragmented, with varying standards of construction, fire safety, storage systems, mechanisation and connectivity.
- High logistics costs:** Inefficient storage, inventory movement, fragmented supply chains and sub-optimal last-mile routing increase the overall cost of logistics and reduce India's competitiveness.
- Low technology penetration:** Many warehouses still depend heavily on manual picking, paper-based processes and basic inventory systems.
 - The challenge is not merely automation but **real-time integration of data across inventory, workers, machines and transport**.
- Skill and Employment Concerns:** Automation can reduce repetitive physical tasks but increases demand for technicians, data-literate supervisors and machine operators.
 - Without planned reskilling, technological transition may create employment displacement rather than productive transformation.

- **Capital and Scalability Constraints:** Sophisticated robotics require substantial upfront investment and may not provide adequate returns in low-throughput or labour-intensive facilities.
 - ♦ Technology needs to therefore be **modular, interoperable and retrofittable**.

Related Efforts & Initiatives for Warehouse Infrastructure

- **National Logistics Policy (NLP), 2022:** aims to create a coordinated, technology-enabled logistics ecosystem and reduce inefficiencies.
- **PM GatiShakti National Master Plan:** integrates infrastructure planning across ministries and improves multimodal connectivity.
- **Unified Logistics Interface Platform (ULIP):** enables integration of logistics-related datasets and promotes end-to-end visibility.
- **Logistics Ease Across Different States (LEADS):** benchmarks States and UTs on logistics performance and encourages reforms.
- **National Industrial Corridor Development Programme:** supports integrated industrial and logistics infrastructure.
- **Warehousing Development and Regulatory Authority (WDRA):** promotes negotiable warehouse receipts and professionalisation of warehousing, particularly for agricultural commodities.
- **Digital India and IndiaAI initiatives:** create an enabling ecosystem for AI-based decision-making, predictive analytics and intelligent logistics.

Way Forward: Strengthening Measures

- India should pursue **'intelligent hybrid warehousing' rather than robotisation for its own sake**.
- AI-based WMS should become the basic digital layer for inventory, picking, slotting and demand forecasting.
- Automation should be targeted at repetitive, high-volume activities where returns justify investment.
- Open standards should ensure that robots, software and logistics platforms from different vendors can communicate.
- Government and industry should create **warehouse-skilling programmes** covering robotics maintenance, data analytics, WMS operation and safety.
- Better data-sharing through **ULIP and GatiShakti** can enable predictive, multimodal supply-chain planning.
- Warehouses should be integrated with green logistics through energy-efficient equipment, rooftop solar, electric material-handling systems and optimised travel paths.

Source: BL

Daily Mains Practice Question

- [Q] Discuss the potential of smart warehousing in reducing logistics costs, improving supply-chain efficiency and supporting India's e-commerce and quick-commerce economy.

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