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NITI Aayog's Manufacturing Roadmap: Building Competitive, Profitable and Globally Integrated Industrial Value Chains for India's 2047 Vision

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Recent Development: NITI Aayog's Global Manufacturing Hub Roadmap:

- **NITI Aayog** has released the opening volume of its study, **"Key Sectors to Position India as a Global Manufacturing Hub"**, which identifies high-potential sectors and proposes a focused strategy for strengthening India's manufacturing competitiveness and integration into **Global Value Chains (GVCs)**. The study builds on NITI Aayog's earlier research initiative to identify sectors with high growth potential, global demand, manufacturing efficiency and value-addition opportunities.
- The broader study identifies sectors including **electronics, automobiles, defence and drones, textiles, solar PV manufacturing, capital goods, steel, food processing, leather and footwear, chemicals, pharmaceuticals and telecom equipment**; NITI Aayog's earlier study documentation also considered **aircraft manufacturing**, so the precise sector count depends on the stage and scope of the study being referred to.
- The opening volume focuses particularly on **chemicals, textiles, telecom and network equipment, and solar photovoltaic manufacturing**, highlighting common constraints such as high costs, inadequate domestic value addition, skill gaps, infrastructure bottlenecks and concentrated export markets.
- The central policy message is a shift from merely increasing manufacturing's **share in GDP** towards creating **profitable, productive, scalable and globally competitive manufacturing capacity**.

Manufacturing Sector in India: Economic and Strategic Significance:

Meaning and Industrial Scope:

- **Manufacturing** refers to the transformation of raw materials and intermediate goods into finished or semi-finished products through labour, capital, technology and industrial processes.
- Major manufacturing activities include **automobiles, pharmaceuticals, chemicals, textiles, electronics, machinery, food processing, metals, defence equipment and renewable-energy equipment**.
- Manufacturing has strong linkages with **agriculture, mining, logistics, energy, infrastructure, services and exports**, making it a critical component of structural economic transformation.

Contribution to the Indian Economy:

- The **Economic Survey 2025–26** notes that manufacturing's share in **real GVA** has remained broadly stable at around **17–18%**, while its **Gross Value of Output (GVO)** has remained around **38%**, indicating the sector's substantial role in overall economic activity.
- The apparently lower manufacturing share in **current-price GVA** reflects, among other factors, relative price effects and the sector's weaker terms of trade rather than simply a decline in physical manufacturing activity.
- The latest MoSPI SDG framework reports manufacturing's share of **Manufacturing Value Added in GDP** at **14.30% at constant prices in 2024–25**, while the corresponding current-price share was **13.14%**.

- Manufacturing accounted for **11.44% of total employment in 2023–24**, compared with **12.13% in 2017–18**, highlighting the continuing challenge of expanding labour-intensive industrial employment.
- The broader **secondary sector** remains important because it combines manufacturing with construction, electricity, gas, water supply and related utilities, thereby linking industrial production with infrastructure and urbanisation.

Why Manufacturing Matters for India's Development:

- **Employment generation:** Labour-intensive manufacturing can absorb workers shifting out of agriculture and create large-scale non-farm employment.
- **Export competitiveness:** Manufacturing enables India to move from low-value activities towards higher-value products within **GVCs**.
- **Productivity growth:** Technology adoption, scale economies and industrial learning can raise labour and total factor productivity.
- **Import resilience:** Domestic production of critical inputs can reduce vulnerabilities arising from global supply disruptions.
- **Technological capability:** Advanced manufacturing strengthens domestic **R&D, engineering, design and innovation ecosystems**.
- **Regional development:** Industrial clusters can promote infrastructure, logistics, urbanisation and employment beyond major metropolitan centres.

NITI Aayog Study: Methodology and Sector Selection:

Four-Phase Methodology:

- **Phase 1 – Sector shortlisting:** Sectors were assessed on the basis of domestic and global market size, future growth prospects and strategic opportunities.
- **Phase 2 – Strategic assessment:** Shortlisted sectors were evaluated through **market potential, competitiveness and strategic relevance**.
- **Phase 3 – Global benchmarking:** International manufacturing leaders were examined to identify transferable **policy, technology, cluster and value-chain practices**.
- **Phase 4 – Action roadmap:** Sector-specific interventions were developed around infrastructure, technology, skills, investment, domestic value addition and export competitiveness.

Major Assessment Parameters:

- The framework considers **market potential, infrastructure readiness, policy support, raw-material availability, technology readiness, employment potential and India's position within the value chain**.
- The approach seeks to avoid indiscriminate industrial subsidies by prioritising sectors where India can develop sustainable **comparative and competitive advantages**.

Sector-Wise Findings: Four Priority Areas:

1. Chemicals:

- India's chemical industry is a major industrial input provider for **pharmaceuticals, textiles, automobiles, agriculture and other manufacturing sectors**.
- The sector includes **petrochemicals and organic chemicals, specialty chemicals and inorganic chemicals**, with petrochemicals and organic chemicals forming the largest segment.
- NITI Aayog identifies a major opportunity in shifting from relatively basic outputs towards **higher-value downstream chemicals** and better utilisation of available feedstocks.
- Priority products for import substitution include **phenol, methanol and acetic acid**, where greater domestic production can reduce foreign-exchange outflows and exposure to international price volatility.

- India's chemical industry was valued at approximately **USD 220 billion in 2023** and has substantial potential for expansion, but its global participation remains constrained by feedstock availability, infrastructure gaps, import dependence and regulatory complexity.

2. Textiles and Apparel:

- The textile and apparel industry is strategically important because it combines **large employment potential, export orientation and relatively labour-intensive production**.
- India was the **sixth-largest exporter of textiles and apparel globally**, with a **4.1% share of global exports in 2024**.
- Textile and apparel exports, including handicrafts, were valued at approximately **USD 37.7 billion in 2024–25**, accounting for around **8.63% of India's merchandise exports**.
- The sector has substantial employment potential, but **labour productivity remains below the overall manufacturing average**, limiting competitiveness in global markets.
- NITI Aayog recommends a stronger shift towards **man-made fibres (MMF)** and higher-value segments to support the ambition of reaching approximately **USD 100 billion in textile and apparel exports**.
- Productivity can be improved through **apprenticeships, industry-academia partnerships, technology adoption and targeted skilling**.
- Affordable and safe accommodation for **migrant workers near industrial clusters** can reduce labour-market frictions and improve workforce stability.
- **Voluntary certification** for firms meeting ethical labour standards can improve workplace practices and strengthen international market credibility.

3. Telecom and Network Equipment:

- India possesses a large domestic telecommunications market, creating a strong demand base for **telecom equipment, network infrastructure and digital technologies**.
- The manufacturing opportunity lies in moving beyond assembly towards **domestic components, product design, R&D, testing and export-oriented production**.
- NITI Aayog emphasises **localisation, domestic component manufacturing, joint ventures, technology transfer, integrated industrial clusters, testing infrastructure and skill development**.
- The Department of Telecommunications is also supporting indigenous telecom innovation through the **Technology Development & Investment Promotion Scheme**, which has an outlay of **?203 crore for 2026–27 to 2030–31** and aims to strengthen innovation, standardisation, testing and exports.
- A stronger domestic telecom-equipment ecosystem can reduce import dependence while supporting India's ambitions in **5G, 6G, optical networks and digital infrastructure**.

4. Solar Photovoltaic Manufacturing:

- India's rapid expansion of solar power creates a large domestic market for **solar cells, modules, wafers, polysilicon and associated equipment**.
- The major structural challenge is that domestic manufacturing remains concentrated towards **downstream stages**, while upstream capabilities such as wafers and polysilicon remain comparatively weak.
- NITI Aayog therefore recommends moving **upstream in the solar value chain** and developing integrated manufacturing capabilities.
- Export concentration is another vulnerability because excessive dependence on a single overseas market can expose Indian manufacturers to **trade-policy changes, tariffs and geopolitical disruptions**.
- Diversifying export destinations and strengthening upstream manufacturing can improve India's **strategic resilience and global competitiveness**.
- The Economic Survey 2025–26 also highlights solar PV as one of the PLI-linked sectors where strong production expansion has been accompanied by substantial growth in imports of intermediate inputs, underlining the need for deeper **domestic value addition**.

Cross-Cutting Manufacturing Strategy: Common Policy Priorities:

Cluster-Based Industrialisation:

- India should promote **integrated manufacturing clusters** with common infrastructure, utilities, logistics, testing facilities, worker accommodation and streamlined approvals.
- Cluster-based production can generate **economies of scale and scope**, reduce transaction costs and enable MSMEs to integrate into larger value chains.
- The model can also facilitate collaboration between **industry, research institutions, skill providers and government agencies**.

Domestic Value Addition:

- Manufacturing growth should not be measured only by the value of final products assembled in India; it should also be assessed through the **domestic value added across the production chain**.
- Greater domestic production of components, intermediate goods, machinery and specialised inputs can improve resilience and reduce excessive dependence on imports.
- The objective should therefore be to move from **assembly-led manufacturing towards deeper value-chain participation**.

Technology and Global Value Chains:

- **Joint ventures and technology transfer** can accelerate access to advanced manufacturing capabilities.
- Indian firms need stronger capabilities in **design, engineering, R&D, process innovation, quality control and intellectual property**.
- Integration into GVCs should be accompanied by gradual movement towards **higher-value activities**, rather than remaining concentrated in low-value assembly.

Skills and Labour Productivity:

- Industrial competitiveness depends not only on capital and infrastructure but also on **worker productivity and technical skills**.
- Industry-linked apprenticeships, vocational training and **industry-academia collaboration** should be aligned with emerging manufacturing technologies.
- Skill development should focus on **advanced machinery, automation, electronics, robotics, digital manufacturing, quality management and green technologies**.

Export Diversification:

- India needs to diversify both its **product basket and geographical export markets**.
- Excessive dependence on a single market creates vulnerability to **tariff changes, geopolitical tensions, regulatory shifts and demand shocks**.
- Balanced and commercially meaningful **Free Trade Agreements (FTAs)** can improve market access when accompanied by domestic competitiveness.

Profitability and Private Investment: A Strategic Shift:

From Manufacturing Share to Manufacturing Competitiveness:

- NITI Aayog Vice-Chairman **Ashok Lahiri** has emphasised that India does not need to replicate China's manufacturing scale directly, but it must capture the benefits of **economies of scale and scope**.

- The government's role should increasingly focus on **removing structural impediments**, while private investment should drive productive capacity and commercial expansion.
- Investment ultimately depends on **profitability**, making cost competitiveness, market access, productivity and technological capability more important than manufacturing targets alone.
- This represents a shift from a narrow objective of raising manufacturing's **GDP share** towards creating commercially viable and globally competitive industrial capacity.

Key Challenges to India Becoming a Global Manufacturing Hub:

Structural and Cost Constraints:

- **High logistics costs, expensive industrial land, costly power and regulatory compliance** can reduce the competitiveness of Indian manufacturing.
- Fragmented supply chains and inadequate industrial infrastructure can prevent firms from achieving efficient production scale.
- Limited access to patient capital can constrain investment in **capital-intensive and technology-intensive industries**.

Import Dependence and Shallow Value Chains:

- Several sectors continue to depend heavily on imported **components, machinery, intermediate goods and critical raw materials**.
- Excessive import dependence can weaken domestic value addition even when final-product exports increase.
- Protection of upstream industries must therefore be calibrated because high-cost domestic inputs can reduce the competitiveness of downstream exporters; the **Economic Survey 2025–26** specifically stresses the importance of maintaining downstream export competitiveness.

MSME Constraints:

- **Micro, Small and Medium Enterprises (MSMEs)** often face constraints in finance, technology, quality certification, market access and managerial capability.
- Weak linkages between MSMEs and large manufacturers can prevent smaller firms from becoming reliable suppliers within **GVCs**.
- Industrial policy should therefore support **MSME scaling, technology upgrading and integration into formal supply chains**, rather than only increasing the number of small firms.

Employment Challenge:

- Manufacturing employment remains relatively modest despite the sector's importance, with its share of total employment at **11.44% in 2023–24**.
- Capital-intensive manufacturing can increase output without generating proportionate employment, creating a need for a balanced strategy combining **advanced manufacturing with labour-intensive sectors**.
- Textiles, food processing, footwear, electronics assembly and selected light-manufacturing activities can provide significant employment opportunities if productivity and export competitiveness improve.

Government Policy Ecosystem: Enabling Manufacturing Competitiveness:

Major Policy Instruments:

- **Make in India:** Promotes domestic manufacturing, investment and industrial capability.
- **Production Linked Incentive (PLI) Schemes:** Encourage investment, production, scale and competitiveness in selected strategic sectors.
- **PM Gati Shakti:** Supports integrated planning of transport and logistics infrastructure.
- **National Logistics Policy:** Seeks to improve logistics efficiency and reduce supply-chain costs.

- **Industrial Corridors:** Promote integrated industrial development around multimodal infrastructure.
- **National Industrial Corridor Development Programme:** Supports large-scale industrial clusters and manufacturing ecosystems.
- **India Semiconductor Mission:** Strengthens domestic semiconductor manufacturing and the wider electronics ecosystem.
- **National Green Hydrogen Mission:** Creates future demand for electrolyzers, renewable-energy equipment and related green technologies.
- **Technology Development & Investment Promotion Scheme:** Supports telecom innovation, standardisation, testing and export capabilities.

Way Forward: Building a Competitive Manufacturing Ecosystem:

From Incentives to Competitiveness:

- Incentives should increasingly be linked to **productivity, technology adoption, exports, domestic value addition and global competitiveness**.
- Public support should correct genuine market failures without permanently insulating firms from international competition.

From Isolated Factories to Industrial Ecosystems:

- India should build **complete industrial ecosystems** containing suppliers, manufacturers, logistics providers, testing centres, research institutions, skilled workers and financial services.
- Such ecosystems can lower production costs and improve innovation through **industrial clustering and knowledge spillovers**.

From Assembly to Value-Chain Leadership:

- India should progressively move from **final assembly towards components, intermediate goods, design, engineering, R&D and intellectual-property-intensive activities**.
- Greater domestic value addition would strengthen both economic resilience and export competitiveness.

From Domestic Market Strength to Global Market Leadership:

- India's large domestic market should be used as a **scale-building platform**, but global competitiveness requires firms to meet international standards of price, quality, technology and reliability.
- Export strategies should focus on **market diversification, standards compliance, trade agreements and long-term integration with GVCs**.

From Quantity of Investment to Quality of Investment:

- Policy should prioritise investment that generates **technology transfer, productivity gains, skilled employment, exports and domestic supplier development**.
- Private investment should remain central, while government should concentrate on **infrastructure, regulatory certainty, skill development, R&D support and market access**.

UPSC Significance: GS Paper-Wise Relevance:

GS Paper III – Indian Economy and Industry:

- **Manufacturing-led growth, industrialisation, employment generation, MSMEs, PLI, GVCs, exports, logistics, FDI, technology transfer and domestic value addition** are directly relevant to GS Paper III.
- The issue can be linked with India's objective of becoming a **developed economy by 2047**.

GS Paper II – Government Policies and Interventions:

- The role of **NITI Aayog, industrial policy, regulatory reforms, skilling, FTAs and Centre-State coordination** provides GS Paper II relevance.

GS Paper I – Geography and Economic Geography:

- **Industrial clusters, industrial corridors, location factors, logistics connectivity and regional industrialisation** provide linkages with economic geography.

Essay and Ethics:

- The manufacturing debate can be used to discuss **development versus sustainability, employment versus automation, self-reliance versus global integration, and state intervention versus market-led growth**.

Value Addition for UPSC: Ready-to-Use Concepts and Data:

Key Data Points:

- **17–18%:** Approximate manufacturing share in **real GVA** according to the Economic Survey 2025–26.
- **38%:** Approximate manufacturing share in **Gross Value of Output**, indicating substantial production activity beyond its GVA share.
- **11.44%:** Manufacturing share in total employment in **2023–24**.
- **4.1%:** India's share of global textile and apparel exports in **2024**.
- **USD 37.7 billion:** India's textile and apparel exports, including handicrafts, in **2024–25**.
- **?203 crore:** Outlay of the **Technology Development & Investment Promotion Scheme** for telecom innovation and standardisation during **2026–27 to 2030–31**.

Possible UPSC Mains Framing:

- **"India's manufacturing challenge is no longer merely about increasing manufacturing capacity, but about creating globally competitive and profitable value chains." Discuss.**