China's Supply Chain Tactics and India's Electronics Industry

Why in the news?

In recent times, China's geopolitical tactics has disrupted India's electronics supply chain, particularly affecting Apple-Foxconn's production.

What is China's Supply Chain Restrictions?

- **Restriction on engineers** – In January 2025, China restricted travel for its engineers in Foxconn's Indian facilities and curbed exports of critical manufacturing equipment, which led to:
  - Crippling Apple-Foxconn's operations and impacting India's manufacturing ambitions.
- **Geo-political weapon** – *Beijing uses supply chain disruptions as a geopolitical weapon*, leveraging its dominance in advanced machinery and electronics to slow India's production.

What are the significance about Electronic Industry/Sector?

- **Dynamic industry** – The electronics sector is a vast and dynamic industry that encompasses the design, development, production, and distribution of electronic devices and components.
- **Driving innovation** – It's a critical part of the global economy, driving innovation and impacting nearly every aspect of modern life.
- **12 million jobs job creation** – The electronics sector in India is expected to create *12 million jobs by 2027*, including both direct and indirect roles.
- **3.4% of GDP** – According to the department of commerce, under the Ministry of Commerce and Industries, the electronic sector contributes 3.4 % to the GDP.

What are the Key Components of Electronic Sector?

- **Semiconductors** – The backbone of modern electronics, used in everything from smartphones to cars.
- **Consumer Electronics** – Products for everyday use, including smartphones, computers, televisions, audio equipment and home appliances.
- **Electronic Components** – Individual parts that make up electronic devices, such as resistors, capacitors and transistors.
- **Industrial Electronics** – Equipment used in manufacturing, automation, and other industrial applications.
- **Telecommunication** – Infrastructure and devices for communication, including networks, mobile phones, and routers.

What are the Recent Developments in the Electronics Sector?

- **Advancements in Semiconductors**
- **Chiplet Design** – Improves performance and efficiency by combining smaller chips.
- **Higher Transistor Density** – Boosts chip performance and reduces power use.
- **AI at the Edge** – AI-powered devices enable faster, local data processing for automation and smart systems.
- *Neuromorphic Computing* mimics the human brain for efficient AI processing.
- **Sustainability Focus** – Efforts to *reduce e-waste* through better recycling and longer product lifecycles.
- Development of *energy-efficient electronics* to lower environmental impact.
- **Internet of Things (IoT) Growth** – Increasing connected devices drive *data collection and automation.*
- ***Industrial IoT (IIoT)*** improves efficiency in manufacturing and logistics.
- **5G & Future Connectivity**
- **5G expansion** – Enables faster speeds and new tech applications.
- **6G research** – Is already underway for even greater connectivity.
- **Flexible & Wearable Electronics**
- **Foldable displays** – Are advancing for use in phones, wearables, and signage
- **Wearable tech** – Like smartwatches continues to evolve with new features.
- **Quantum Computing Progress** – Still in early stages, but has potential in *drug discovery, materials science, and cryptography.*
- Research is ongoing to develop *powerful and stable quantum computers.*

What are the Major Challenges in the Electronics Sector?

- **Supply Chain Disruptions** – Dependence on limited suppliers, especially China, leads to vulnerabilities.
- Geopolitical tensions and global crises impact the availability of key components.
- **Semiconductor Shortages** – High demand and limited production capacity cause delays in manufacturing.
- Need for more semiconductor fabrication plants (fabs) outside dominant regions.
- **High Dependence on Imports** – Many countries, including India, rely heavily on imported electronic components.
- Lack of local ecosystem for semiconductor manufacturing.
- **Rapid Technological Changes** – Constant innovation requires frequent upgrades and heavy R&D investments.
- Businesses struggle to keep pace with emerging technologies like AI, IoT, and 5G.
- **E-Waste Management & Sustainability** – Rising electronic waste due to short product life cycles.
- Need for better recycling processes and use of eco-friendly materials.
- **Cybersecurity & Data Privacy Risks** – Increased connectivity (IoT, 5G) raises risks of hacking and data breaches.
- Strengthening digital security measures is crucial.
- **High Manufacturing Costs** – Setting up advanced fabrication units and R&D centres requires huge investments.
- Labour and operational costs impact competitiveness.

- **Skilled Workforce Shortage** – Demand for skilled professionals in semiconductor design, AI, and quantum computing is growing.
- Need for better training and education programs.

What are the Government Initiatives to Boost Electronics Manufacturing in India?

- **Production Linked Incentive (PLI) Schemes**
- **PLI for Large-Scale Electronics** – Provides financial incentives for mobile phone and electronic component manufacturing to attract investments and increase domestic value addition.
- **PLI for IT Hardware** – Encourages local production of laptops, tablets, PCs, and servers to position India as a global IT hardware hub.
- **Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS)** – Offers financial support for manufacturing semiconductors, electronic components, and display fabs to reduce import dependence.
- **Modified Electronics Manufacturing Clusters (EMC 2.0) Scheme** – Supports infrastructure development for electronics manufacturing hubs with financial assistance for shared facilities and investments.
- **Semicon India Program** – Promotes semiconductor design and manufacturing by offering incentives for setting up fabs and attracting global semiconductor companies.
- **Make in India** – Encourages domestic manufacturing across industries, including electronics, by improving the ease of doing business.
- **Digital India** – Boosts demand for electronic devices and components by promoting digital technologies across various sectors.
- **National Manufacturing Mission (NMM)** – Aims to boost India's manufacturing sector and increase its *GDP share to 25% by 2025.*
- It was announced during the ***Union Budget (2025- 2026)***.
- It supports small, medium, and large industries under **"Make in India"** while enhancing self-reliance and global competitiveness.

What is the Way Forward?

- *Boost local manufacturing* through incentives like India's PLI scheme.
- *Invest in R&D* to stay competitive in emerging technologies.
- *Enhance recycling & sustainability efforts* to tackle e-waste.
- *Strengthen cybersecurity measures* to protect data and devices.

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