

5. Middle East Conflict – International Relations

The ongoing Middle East conflict has severely disrupted global supply chains for critical raw materials used in printed circuit board manufacturing, causing sharp price surges across the electronics industry worldwide.

1. Background

For decades, the electronics industry operated on the assumption of stable, geographically diversified supply chains for essential components. However, recent geopolitical tensions in the Middle East have exposed the fragility of this assumption. A strike on Saudi Arabia's Jubail petrochemical complex, combined with supply uncertainties from conflict-affected regions like Israel and Jordan, has triggered cascading disruptions in PCB manufacturing.

Printed circuit boards, the backbone of modern electronics from smartphones to AI servers, rely on specialized materials sourced from geopolitically sensitive zones. This crisis has forced nations to confront their strategic vulnerabilities and accelerate efforts toward supply chain localization and diversification.

2. Understanding Printed Circuit Boards

What are PCBs

1. A PCB is a layered mechanical structure designed to hold and electrically connect electronic components within a circuit system.
2. It serves as the foundational platform for assembling electronic parts while guiding the controlled flow of electricity between different components.
3. PCBs are integral to virtually all modern electronic devices including smartphones, computers, tablets, AI servers, smartwatches, and industrial equipment.

3. Critical Raw Materials in PCB Manufacturing

Resin-Based Substrates

1. High-purity Polyphenylene Ether and epoxy resins function as critical base materials for manufacturing laminates.
2. These laminates form the insulating substrate of the circuit board, providing electrical isolation between conductive layers.

Conductive and Structural Materials

1. Copper foil serves as the primary conductive material, accounting for approximately 60% of total raw material costs in PCB production.
2. Glass fibre is embedded within the substrate as a reinforcing material, providing essential structural strength and enhanced insulation properties.

Specialized Industrial Gases and Chemicals

1. Qatar supplies over one-third of the world's helium, which is indispensable for semiconductor lithography processes.
2. Two-thirds of global bromine production comes from Israel and Jordan, used extensively for etching processes in PCB manufacturing.

4. Emerging Supply Chain Vulnerabilities

Geopolitical Disruptions

1. The strike on Saudi Arabia's Jubail petrochemical complex has severely disrupted production of PPE resin, a key material for PCB laminates.
2. Conflict zones in the Middle East threaten consistent supply of helium and bromine, creating bottlenecks in semiconductor and etching processes.

China's Manufacturing Dominance

1. China controls over 50% of global PCB manufacturing output, creating dangerous single-source concentration risk for the world.

2. This dominance gives China disproportionate influence over global electronics supply chains and pricing mechanisms.

India's Strategic Vulnerability

1. India's PCB industry remains critically dependent on imported raw materials including copper-clad laminates, specialty chemicals, and soldering compounds.
2. The bulk of India's PCB requirements are imported from China, Taiwan, and South Korea, exposing strategic sectors to external dependencies.
3. This import reliance poses significant risks to defence manufacturing, telecommunications infrastructure, and the rapidly expanding electric vehicle sector.

5. India's Policy Response Framework

Electronics Component Manufacturing Scheme

1. The Union Cabinet approved ECMS in April 2025 under the Ministry of Electronics and IT with a substantial outlay of ₹22,919 crore.
2. The scheme specifically targets critical components including PCBs, SMD passives, lithium-ion cells, capacitors, connectors, and copper laminates.
3. It addresses areas of peak import dependence through strategic incentive structures designed to attract domestic and foreign investment.
4. ECMS offers up to 25% capital subsidy for establishing manufacturing facilities, reducing initial investment barriers significantly.
5. Additionally, it provides 4-6% incentive on incremental sales, creating ongoing revenue support distinct from traditional PLI schemes.

Production-Linked Incentive Scheme

1. The PLI for Large Scale Electronics Manufacturing has successfully attracted major global players including Apple through Foxconn and Tata Electronics.
2. This initiative has propelled India to become the world's second-largest mobile phone manufacturer globally.
3. However, the scheme's limitation lies in its focus on final product assembly rather than upstream component and PCB manufacturing capabilities.

Semiconductor Mission Strategy

1. Six semiconductor manufacturing projects are currently in execution phase across multiple Indian states.
2. Four additional projects have received approval for establishment in Odisha, Punjab, and Andhra Pradesh.
3. The mission envisions creating a fully self-reliant semiconductor-to-PCB value chain by 2030, reducing dependence on foreign suppliers.

6. Strategic Implications for India

Defence and Security Concerns

1. Heavy import dependence on PCBs compromises indigenous defence manufacturing capabilities and national security preparedness.
2. Strategic electronic systems for military applications require secure, domestically controlled supply chains to prevent external leverage during conflicts.

Economic and Industrial Impact

1. Rising raw material prices due to Middle East disruptions directly impact India's electronics manufacturing competitiveness and export potential.
2. The growing electric vehicle and renewable energy sectors face cost escalations that could slow down India's clean energy transition.

Technological Sovereignty

1. Building indigenous PCB manufacturing capacity is essential for achieving technological self-reliance in critical emerging technologies.

2. Control over the electronics value chain determines a nation's ability to innovate and compete in AI, IoT, and advanced computing domains.

7.Way Forward

Accelerate Raw Material Localization

1. India must urgently establish domestic production facilities for critical PCB raw materials including high-purity resins, copper-clad laminates, and specialty chemicals through targeted incentives and technology partnerships with allied nations.

Diversify Strategic Sourcing

1. The government should facilitate long-term supply agreements with multiple geographically diverse partners beyond China and Middle East, while building strategic reserves of critical materials to buffer against geopolitical shocks and supply disruptions.

Strengthen Component Manufacturing Ecosystem

1. Full implementation of ECMS with fast-track approvals, infrastructure support, and skill development programs is essential to create a robust domestic PCB and component manufacturing base that supports both defence and commercial electronics sectors.

Conclusion

The Middle East conflict has exposed critical vulnerabilities in global PCB supply chains, with India particularly susceptible due to heavy import dependence. The government's ₹22,919 crore ECMS initiative represents a strategic pivot toward self-reliance in electronics component manufacturing. However, achieving true technological sovereignty requires urgent action on raw material localization, diversified sourcing partnerships, and accelerated implementation of semiconductor and PCB manufacturing capabilities by 2030.

Source - <https://www.reuters.com/world/middle-east/iran-war-disrupts-the-circuit-board-supply-chain-raises-costs-tech-firms-2026-04-27/>

