



# Semiconductor Sector-Trends Issues and Challenges

*Developing semiconductors within the country is essential for the Indian government's goal of establishing a domestic electronics supply chain and decreasing reliance on foreign countries, particularly China, which continues to be a leading destination for such manufacturing despite its own problems. India is currently facing a critical moment to enter the field of electronics manufacturing, as semiconductor chips play a crucial role in all electronic devices. With more companies seeking to diversify their manufacturing, India has the chance to position itself as a dependable alternative to existing manufacturing countries. From 2017 to 2022, the semiconductor manufacturing sales value of India experienced a Compound Annual Growth Rate (CAGR) of nearly 11%. According to a report from Deloitte, the market is projected to reach a value of \$55 billion by 2026, growing from \$27 Billion in 2022 at a 20% CAGR. The report highlights that three industries, namely smartphones and wearables, automotive components, and computing and data storage, are expected to drive over 60% of the market growth. Following the Government's push under the India Semiconductor Mission, the country is said to manufacture its first Chips in December 2024, with 4-5 semiconductor facilities expected to be built by mid-2024.*

## Issues and Challenges

Despite engaging in semiconductor design and outsourcing manufacturing to countries like China, Taiwan, the USA, and a few European nations, India remains heavily reliant on imports and is primarily involved in the design, assembly, testing, and packaging stages of semiconductor production. Moreover, the semiconductor industry demands significant investments in equipment, research, and development, leading companies to hesitate in making substantial investments without adequate government support.

In addition to concerns surrounding India's policy stability, the semiconductor industry encounters several challenges. The sector requires specialized infrastructure for chip manufacturing, and the lack of improvements in the existing infrastructure hinders India's ability to expand its chip production capabilities. Despite having a large population and an estimated nearly 20% of the world's semiconductor design engineers, India faces a shortage of skilled workers experienced in semiconductor manufacturing.

Some of India's efforts so far have also hit roadblocks, such as the Vedanta-Foxconn joint venture (JV) which had committed to establish a 28-nanometer semiconductor fabrication facility and requested approximately \$3.7 billion in fiscal assistance. Despite Foxconn's status as the world's leading electronic products manufacturer and assembler, neither of the primary partners possessed any prior experience in semiconductor chip fabrication. Regrettably, the JV encountered challenges in identifying a suitable fab-manufacturer partner or a technology supplier for the project. While the venture received approval from the Gujarat government and a Memorandum of Understanding (MoU) was signed, the project proposal eventually stalled, leading to Foxconn's ultimate withdrawal from the JV. There has also been criticism that the government has been over-generous with fiscal support for the Micron Plant, which is essentially only a packaging and testing facility.

India also faces intense competition from well-established semiconductor industries in countries like China, Taiwan, and South Korea, which possess robust ecosystems of suppliers and customers. The United States, a crucial bilateral partner in the industry, has formed the Chip 4 alliance with top semiconductor manufacturers such as Taiwan, Japan, and South Korea, further highlighting India's distant position as a trusted partner. Additionally, the chip-making industry exhibits high concentration, with companies like TSMC holding virtual monopolies on certain types of chipsets.



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This poses a significant challenge for India in establishing a competitive presence in the market.

### **MoU with the US**

In March 2023, India and the United States entered into a Memorandum of Understanding (MoU) to facilitate the formation of a Semiconductor Sub-Committee under the Commercial Dialogue involving the U.S. Department of Commerce, India's Ministry of Electronics and Information Technology (MeitY), and the Ministry of Commerce. The purpose of this MoU is to establish a collaborative mechanism between the two governments focusing on enhancing the resilience and diversification of the semiconductor supply chain. This initiative aligns with the United States' CHIPS and Science Act and India's Semiconductor Mission.

### **Dependence on China for Critical Raw Materials**

Despite possessing 6% of the world's rare earth reserves, India's contribution to global output is merely 1%, and the majority of its demand for these minerals is fulfilled through imports from China. Hence, to combat China's dominance in critical minerals crucial for semiconductor manufacturing, India needs to adopt a multi-faceted approach. This includes diversifying supply sources by exploring partnerships with resource-rich nations, promoting domestic mining of critical minerals, and encouraging recycling and the circular economy to reduce dependency on primary extraction. India should also prioritise research and development efforts to find substitutes for critical minerals or develop technologies that require fewer amounts. India should consider moving towards aligning with the Minerals Security Partnership (MSP), an international initiative led by the United States. The objective of the MSP is to strengthen critical mineral supply chains by promoting the production, processing, and recycling of these minerals in a manner that supports countries in securing a reliable and stable supply for their economies. Strengthening international collaborations, supporting domestic manufacturing, and implementing policy and regulatory reforms that incentivize investments in critical minerals infrastructure is, therefore, essential.

### **Overall Supply Chain Resilience**

Currently, the production and distribution of semiconductors are geographically concentrated, leading to imbalances where some regions have excess supply while others struggle to meet their minimum requirements. To address this issue, a focus on diversification is necessary, allowing manufacturing facilities to operate globally regardless of their location. Recognizing the significance of diversification, manufacturers worldwide are actively establishing manufacturing units in different countries. India should attract the attention of companies seeking expansion by providing incentives and creating a favourable business environment. Additionally, implementing digital technologies throughout the transportation system is essential to achieve a resilient supply chain. For instance, digitizing customs procedures would enhance efficiency within the entire ecosystem. Embracing digitalization within the supply chain enables companies to make data-driven decisions faster, improve inventory strategies, and take timely actions. Leveraging advanced visibility tools like Artificial Intelligence and Internet of Things is crucial for enhanced transparency in the supply chain network, facilitating the identification and resolution of issues to minimize disruptions. Collaboration and partnerships among stakeholders is the key. Manufacturers, suppliers, logistic partners, and buyers should work together to find the most efficient means of product transportation. Establishing a global network of key players with a centralized management system would contribute to the desired resilience. Logistic providers can play a significant role by offering additional warehouse space, inventory data, and analytics to facilitate inventory management. Moreover, India should develop strategic alliances with countries involved in different stages of the semiconductor supply chain, such as pre-silicon, silicon processing, and post-silicon. While India excels in the pre-silicon stage with competencies in CAD software, IP blocks, and simulation, it should seek partnerships with nations proficient in the other two stages.

### **Conclusion**

The Indian semiconductor industry should explore all possibilities and opportunities for domestic production and imports while collaborating with major global players. While budgetary allocation will undoubtedly support the sector, additional government support is required to overcome obstacles and establish a foundation for meeting future chip requirements. Finally, a resilient and secure supply chain for critical minerals and components should be established through diversification of sources and proactive measures to ensure supply chain stability.

*(The views expressed are our own and not attributable to the organization).*