Topic Overview: Promoting the Development of microchip technologies in developing regions

Microchip technology actually plays a far greater role than most people realize. These tiny circuits known as microchips or semiconductors power everything from phones to cars to medical devices and even AI. A microchip functions as the control center of every electronic device. Everything about the way a device functions is due to its microchip, which processes data, stores information, and directs the way the device operates.

Microchip technology is the science, engineering, and manufacturing procedures that go into making and using microchips. In today's technology-driven world, microchips are the core on which every modern industry relies; without them, no electrical device could function. That is why microchip technology is a crucial part of building and sustaining a developing country. Its history dates back to the innovation of the transistor all the way in 1947 which led to the innovation of semiconductors. Over the decades, the semiconductor industry has become highly specialized and geographically distributed and largely driven by advanced economies that hold both the technology and manufacturing capacity, such as the United States, The European Union, Taiwan, Japan, and South Korea. Developing nations continue to fall far behind, emphasizing the pressing need for support and collaboration.

The barriers are obvious for developing regions: insufficient infrastructure, which is necessary for the fabrication of semiconductors, such as clean energy, reliable power, and advanced factories; a lack of funding; a shortage of skilled labor, specifically engineers and technicians; and limited access to modern and advanced technology. These obstacles prevent many developing regions from participating in the global semiconductor value chain, leaving them dependent on other regions. Addressing this pressing issue is essential since microchips are not only vital for technological sovereignty but also it is fundamental to a country's economic growth and national security.

Developing these regions' capacity for microchips, their production, and their use allows them to engage in a global digital economy, reduce their reliance on exports, and encourage innovation that fulfills regional and local demands.

However, creating, advancing, and maintaining microchip technology and semiconductors is extremely costly for a country, including their complexity, making it impossible for a company or even a country to manage on its own. Once a country has leadership over microchip technology, losing would mean losing their economic competitiveness, technological sovereignty, and even national security. These tiny chips actually require thousands of steps to create, which is why countries are each divided into steps to create them, which makes microchips the most globalized product in the world. This allows production to be easier and faster; however, if one country faces a conflict, it becomes an issue for the whole world since a part of the production chain will be disrupted. That is why countries rely on each other for their most critical technology, which requires extreme mutual trust and powerful trading relationships. Since no country can “go it alone,” meaning work on them independently, countries must strongly cooperate and coordinate with one another, and working together means that they can secure the chip supply chain.

Topic 2 relevant parties

1. United States: As home to companies like Intel and Qualcomm, the US controls important chip design patents and sets export rules that decide which nations can access the most advanced technology.

2. China: China's semiconductor sector is growing rapidly. It builds fabrication plants at home and invests in overseas facilities and training to strengthen supply chains while reducing foreign dependence.

3. Taiwan: Through TSMC, Taiwan dominates high-end chip manufacturing worldwide. Any country aiming for advanced production often relies on its expertise.

4. South Korea: Samsung, SK Hynix, and other South Korean firms lead in memory chip production. The country also supports global semiconductor development through partnerships and tech-sharing agreements.

5. Japan: Japan supplies vital raw materials and manufacturing tools. Its partnerships, often in the form of joint ventures, help transfer knowledge to developing markets.

6. Netherlands: The Netherlands is home to ASML, the only producer of EUV lithography machines needed for the most advanced chips, giving it a key role in the supply chain.

7. Germany: Germany is expanding chip production under the EU Chips Act, focusing on semiconductors for cars and industrial uses.

8. France and Italy: These countries, through STMicroelectronics and other ventures, contribute to chip design, power electronics, and packaging, supporting production in several regions.

9. United Kingdom: The UK is recognised for chip architecture expertise, particularly through Arm Holdings, and partners with developing countries to build design capacity.

10. India: India's national semiconductor mission includes incentives for fabrication plants and investments in assembly and testing, aimed at growing its role in global supply chains.

11. Vietnam: Vietnam is positioning itself as a hub for chip assembly, testing, and design, attracting major investment from the US and South Korea.

12. Malaysia: Malaysia has decades of experience in chip assembly and testing and can assist new entrants to the sector.

13. Singapore: Hosting research centres and advanced packaging facilities, Singapore is known for its efficient supply chain management.

14. Philippines and Thailand: Both contribute to chip assembly and testing and maintain strong technical training programmes.

15. Israel: Israel focuses on chip design and security hardware, often working on collaborative research & developement with other countries.

16. Ireland: Ireland provides advanced manufacturing and engineering expertise that can be transferred to new markets.

17. Mexico: Its large electronics and automotive industries make Mexico a natural base for chip assembly and packaging.

18. Morocco: Morocco's assembly and testing plants for European firms give African countries a route into the semiconductor market.

19. United Arab Emirates and Saudi Arabia: Both invest heavily, using sovereign wealth funds to develop fabrication plants, research hubs, and training as part of economic diversification.

20. Multilateral Lenders (World Bank, regional development banks): These organisations fund infrastructure, skills training, and projects that help developing nations enter the semiconductor industry.

Topic 2 Keywords

1. Microchip / Semiconductor: A small electronic component made of silicon that powers devices such as computers, phones, and cars.

2. Semiconductor Supply Chain: The global network of design, manufacturing, assembly, testing, and distribution processes that produce microchips.

3. Fabrication Plant (Fab): A factory where semiconductors are manufactured.

4. Technology Transfer: The sharing of technical knowledge, skills, or equipment from one country or organisation to another.

5. Intellectual Property (IP): Legal rights protecting inventions, designs, and technologies from being used without permission.

6. Chip Shortage: A global lack of available semiconductors that disrupts industries such as cars, electronics, and medical devices.

7. R&D (Research and Development): Work dedicated to creating new technologies or improving existing ones before they are commercialised.

8. ASML: A Dutch company that produces the world's most advanced machines for manufacturing microchips.

9. EUV (Extreme Ultraviolet Lithography): A technology that uses extremely short wavelengths of light to print very small patterns on microchips, enabling more powerful

processors.

10. TSMC (Taiwan Semiconductor Manufacturing Company): The world's largest and most advanced chip manufacturer, producing chips for Apple, AMD, and Nvidia under a foundry model.

11. STMicroelectronics: A European semiconductor company, jointly owned by French and Italian interests, that makes chips for cars, electronics, and power systems.

12. Technological Sovereignty: A nation's independence in developing and controlling its own critical technologies, such as semiconductors.

Sources use for topic 2

https://itif.org/publications/2020/09/17/allied-approach-semiconductor-leadership/

https://www.imec-int.com/en/what-we-offer/semiconductor-education-and-workforce-development/microchips#what
https://en.clickpetroleoegas.com.br/o-microchip-o-cerebro-do-seculo-xxi-que-comecou-com-um-circuito-minusculo/

https://itif.org/publications/2021/02/18/moores-law-under-attack-impact-chinas-policies-global-semiconductor/

https://www.semiconductors.org/wp-content/uploads/2018/06/SIA-Beyond-Borders-Report-FINAL-June-7.pdf

https://www.hitachi-hightech.com/global/en/knowledge/semiconductor/room/about/history.html

https://www.mckinsey.com/industries/semiconductors/our-insights/semiconductors-have-a-big-opportunity-but-barriers-to-scale-remain

https://www.nature.com/articles/s41599-024-03253-5

https://sourceability.com/post/the-biggest-challenge-impacting-the-semiconductor-industry-today-supply-chain-disruptions

https://www.digitimes.com/news/a20241209PD209/emerging-market-28nm-wafer-development-technology.html

Citation

Global E-Waste Monitor 2024: Electronic Waste Rising Five Times Faster than Documented e-Waste Recycling | Unitar, unitar.org/about/news-stories/press/global-e-waste-monitor-2024-electronic-waste-rising-five-times-faster-documented-e-waste-recycling. Accessed 21 Aug. 2025.

“Electronic Waste (e-Waste).” World Health Organization, www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste). Accessed 21 Aug. 2025.

Ezell, Stephen. “An Allied Approach to Semiconductor Leadership.” RSS, Information Technology and Innovation Foundation | ITIF, 12 June 2024, itif.org/publications/2020/09/17/allied-approach-semiconductor-leadership/. Accessed 21 Aug. 2025.

“Microchips: Everything You Need to Know.” Imec, www.imec-int.com/en/what-we-offer/semiconductor-education-and-workforce-development/microchips#what. Accessed 21 Aug. 2025.

Nogueira, Paulo. “The Microchip – the ‘Brain’ of the 21st Century That Began with a Tiny Circuit.” CPG Click Petroleo e Gas, 22 June 2025, en.clickpetroleoegas.com.br/o-microchip-o-cerebro-do-seculo-xxi-que-comecou-com-um-circuito-minusculo/. Accessed 21 Aug. 2025.

Ezell, Stephen. “Moore’s Law under Attack: The Impact of China’s Policies on Global Semiconductor Innovation.” RSS, Information Technology and Innovation Foundation | ITIF, 15 Jan. 2025, itif.org/publications/2021/02/18/moores-law-under-attack-impact-chinas-policies-global-semiconductor/. Accessed 21 Aug. 2025.

Beyond Borders, www.semiconductors.org/wp-content/uploads/2018/06/SIA-Beyond-Borders-Report-FINAL-June-7.pdf. Accessed 21 Aug. 2025.

Hitachi High-Tech Corporation. “4. History of Semiconductors.” Hitachi High-Tech Corporation, www.hitachi-hightech.com/global/en/knowledge/semiconductor/room/about/history.html. Accessed 21 Aug. 2025.

Wiseman, Bill, et al. “Semiconductors Have a Big Opportunity-but Barriers to Scale Remain.” McKinsey & Company, 21 Apr. 2025, www.mckinsey.com/industries/semiconductors/our-insights/semiconductors-have-a-big-opportunity-but-barriers-to-scale-remain. Accessed 21 Aug. 2025.

Ou, Suhua, et al. “The Global Production Pattern of the Semiconductor Industry: An Empirical Research Based on Trade Network.” Nature News, Nature Publishing Group, 12 June 2024, www.nature.com/articles/s41599-024-03253-5. Accessed 21 Aug. 2025.

Albert Lin, column; Jingyue Hsiao. “Challenges in Developing Semiconductor Industries in Emerging Countries.” DIGITIMES, DIGITIMES Inc., 10 Dec. 2024, www.digitimes.com/news/a20241209PD209/emerging-market-28nm-wafer-development-technology.html. Accessed 21 Aug. 2025.