

Silicon Diplomacy: How AI and Robots are Reshaping Global Geopolitics

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Introduction

In the digital era of rapid technological innovations, the semiconductors has become a source of conflict to wage technological warfare between nations of the world in the present geopolitical landscape. Moreover, the ongoing weaponization of the critical supply chain of semiconductors² has necessitated countries like Taiwan to diversify their center of manufacturing to other countries in South Asia and Australasia.³



Source: LinkedIn

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² “Silicon Diplomacy: Semiconductor Geopolitics and Technological Warfare.” n.d. Imphal Free Press. <https://www.ifp.co.in/opinion/silicon-diplomacy-semiconductor-geopolitics-and-technological-warfare>.

³ The term “Australasia” was coined by the Frenchman Charles de Brosses to refer collectively to the lands south of Asia, or present-day Australia and New Zealand. It Australia, New Zealand, and neighbouring islands in the South Pacific Ocean.

Therefore, it has given rise to a new form of diplomacy between nations — known as the “Silicon Diplomacy”, that is playing a significant role in the advancement of Artificial Intelligence (AI) and robots. Thus, it is quite evident that the geopolitical landscape of the globe is getting reshaped every now and then through the means of Silicon Diplomacy.

What is Silicon Diplomacy?

Silicon Diplomacy represents a specialized form of diplomatic engagement focused on the production, distribution, and supply of semiconductors among nations. It entails diplomatic efforts aimed at fostering collaboration and cooperation among nations in the semiconductor industry. It involves negotiations, agreements, and strategic alliances to ensure the smooth flow of semiconductor materials and technologies across borders.

Semiconductors are substances that have conductivity between conductors and insulators.⁴ These semiconductor components serve as critical and fundamental building blocks for various technological innovations and almost all modern electronics and information and communication technology products, including machinery incorporating advanced technologies such as AI. At the core of the entire digital universe lies the millions of 1s and 0s driving the next phase of global digital transformation under Industry 4.0. The significance of ‘Semiconductor’ lies in the fact that, today, the fate of nation-states has turned on their ability to harness computing power.

Although there is no particular individual or organization that can be given the sole credit of coining the term “Silicon Diplomacy”, it emerged as a modified version of ‘Tech’ or ‘Technology Diplomacy’. Technology Diplomacy tend to focus on all kinds of critical technologies, such as artificial intelligence, semiconductors, 5G networks, Internet of Things (IoT), quantum computing, robotics, blockchain, 3D printing, augmented and virtual reality, or synthetic biology, to name just a few.⁵ However, silicon diplomacy specifically focuses on the diplomatic interactions between states in terms of semiconductors and its supply chain.

⁴ “Silicon Diplomacy: Semiconductor Geopolitics and Technological Warfare.” n.d. Imphal Free Press. <https://www.ifp.co.in/opinion/silicon-diplomacy-semiconductor-geopolitics-and-technological-warfare>.

⁵ Garcia*, Eugenio V. “What Is Tech Diplomacy? A Very Short Definition | beyond the Horizon ISSG.” June 14, 2022. <https://behorizon.org/what-is-tech-diplomacy-a-very-short-definition/>.

AI and Robots in Silicon Diplomacy: Are They Reshaping the Landscape of Global Geopolitics?

The rapid advancement of artificial intelligence (AI) and robotics is not only transforming industries and economies but also reshaping the landscape of global geopolitics. Therefore, 'Silicon Diplomacy' highlights the growing influence of technology companies and their innovations on international relations and diplomatic strategies. As AI and robotics become integral to national security, economic competitiveness, and societal infrastructure, their impact on global power dynamics and geopolitical alliances is profound and far-reaching.

China's Dominance in Silicon Production

China exerts significant control over global silicon prices due to its status as the world's foremost silicon producer, with a production volume reaching 6.6 million metric tonnes in 2023. Renowned for its prolific production of silica, a key component in silicone manufacturing, China benefits from abundant natural resources of quartz sand. Additionally, China holds the distinction of being the largest global producer of silicon metal, commanding a staggering 70 percent of the global production share.

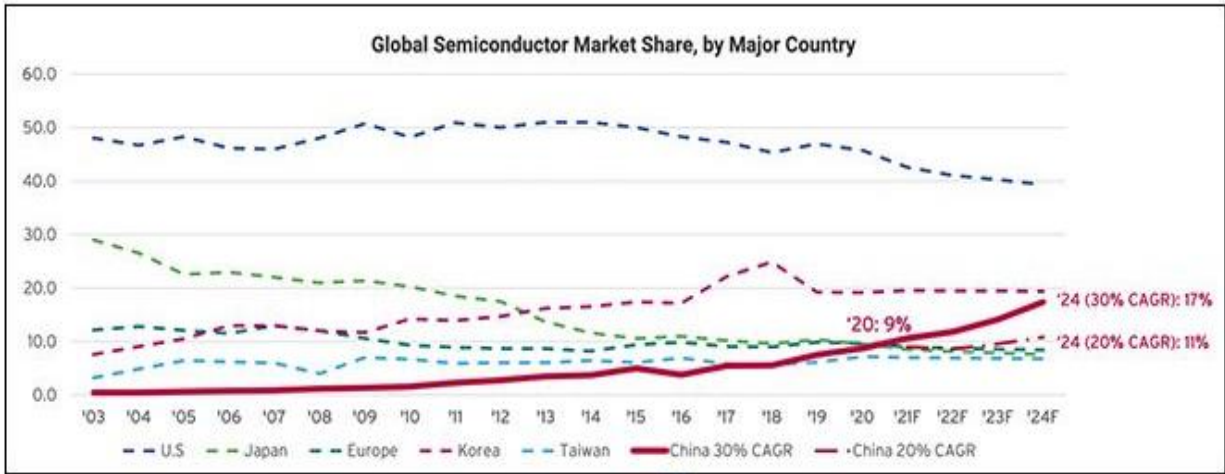
The ample reserves of high-quality silica within China empower manufacturers to craft silicone endowed with exceptional mechanical properties, including superior elasticity, resilience to extreme temperatures and pressures, and remarkable tensile strength. The accessibility of raw materials further affords Chinese manufacturers a competitive edge, allowing them to yield silicone products at markedly reduced costs compared to their global counterparts. Leveraging economies of scale, Chinese manufacturers can engage in large-scale production, thereby enhancing cost efficiencies.

Furthermore, China has articulated intentions to constrain the exportation of strategic minerals such as gallium and germanium to foreign nations, a move aimed at fortifying its competitive advantage in the global arena.

The worldwide value chain of the semiconductor industry needs collaboration over self-reliance, which requires the establishment of 'techno-democratic alliances.' Despite efforts to reduce China's dominance, the country maintains its dominant position, as evidenced by 19 of the top 20 rapidly

developing semiconductor businesses being from China. China's ambitious undertakings, such as the 'Make in China 2025' project, and considerable investments highlight its rise.

Projections include a 30% compound annual growth rate (CAGR), which may increase China's market share to 17.4 percent within three years, evoking strategic reactions from other players.



Source: Semiconductor Industry Association (SIA)⁶

How AI and Robots are Reshaping Global Geopolitics

In recent years, the intersection of artificial intelligence (AI) and robotics with diplomatic endeavors has catalyzed discussions surrounding their profound implications for global geopolitics. As nations increasingly integrate these cutting-edge technologies into diplomatic practices through the increasing production of silicon, the silicon diplomatic landscape undergoes a fundamental transformation. Now, let us look into how AI and robots are reshaping the global geopolitics. The ways are as follows:

⁶ “China’s Share of Global Chip Sales Now Surpasses Taiwan’s, Closing in on Europe’s and Japan’s.” Semiconductor Industry Association. January 10, 2022. <https://www.semiconductors.org/chinas-share-of-global-chip-sales-now-surpasses-taiwan-closing-in-on-europe-and-japan/>.

Enhancing Diplomatic Capabilities

AI algorithms can analyze vast amounts of data, providing diplomats with critical insights and predictive analytics. As a result, AI is playing a vital role in enhancing diplomatic capabilities of the nations. For example, AI can analyze social media trends and public opinion to guide diplomatic strategies.⁷

Moreover, robots are being employed in embassies for tasks such as visitor management, document handling, and even providing information to visitors. This enhances efficiency and security. For example, we can consider the use of SoftBank's Pepper robot in Japanese embassies to assist visitors.⁸

Initiating the Geopolitical Competition and Influence

AI and robots are initiating global competition and influencing the foreign policy of the nation-states. Nations are leveraging AI and robotics to gain geopolitical advantage. Whether through AI-enabled surveillance, autonomous drones, or robotic military systems, countries are expanding their influence and reshaping power dynamics on the global stage.

For example, China's extensive use of artificial intelligence (AI) in surveillance for both domestic control and international intelligence has significant implications for global geopolitics.⁹

Domestically, the Chinese government employs AI-driven surveillance technologies to monitor and control its population, utilizing an extensive network of cameras equipped with facial recognition software.¹⁰ This system, known as the Golden Shield Project, integrates national

⁷ “Artificial Intelligence: Research & Analysis | CSIS.” n.d. Wwww.csis.org. <https://www.csis.org/topics/technology/artificial-intelligence>.

⁸ “‘Pepper’ to Be Placed at Ueno Station on a Trial Basis!” n.d. Wwww.tokyometro.jp. Accessed June 6, 2024. https://www.tokyometro.jp/lang_tcn/news/157701.html?width=816&height=650.

⁹ Jili, Bulelani “China’s Surveillance Ecosystem and the Global Spread of Its Tools.” Atlantic Council. October 17, 2022. <https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/chinese-surveillance-ecosystem-and-the-global-spread-of-its-tools/>.

¹⁰ Wang, Maya “China’s Techno-Authoritarianism Has Gone Global.” Human Rights Watch. April 8, 2021. <https://www.hrw.org/news/2021/04/08/chinas-techno-authoritarianism-has-gone-global>.

surveillance networks to bolster public security and social control. It includes 416 million surveillance cameras and various technologies like geo-location and big data analytics to enhance state security capabilities.

Cyber Diplomacy and Security

AI-powered security systems can help identify and prevent cyber threats, monitor user behavior, detect vulnerabilities, and automate security responses. Additionally, AI is significantly helping nations to improve access control and enhance the overall security of real-time systems in healthcare.¹¹ As a result, the nations are leveraging the power of AI in multi-diverse manner.

Economic Diplomacy and Trade

AI analytics inform economic policies by predicting market trends, enhancing trade negotiations, and optimizing resource allocation.¹² Robotics automation transforms manufacturing, impacting global trade by improving efficiency and reducing production costs. For example- we can consider Germany's use of robotics in the automotive industry to maintain its competitive edge in global trade.¹³ Moreover, the diplomatic efforts increasingly focus on fostering innovation ecosystems and securing access to emerging technologies.

¹¹ Dr. Arab Mohammed Shamiulla, ed. n.d. https://www.researchgate.net/publication/364094636_Role_of_Artificial_Intelligence_in_Cyber_Security#:~:text=AI%20powered%20security%20systems%20can,real%2Dtime%20systems%20in%20healthcare.

¹² Cazzaniga, Mauro, Florence Jaumotte, Longji Li, Giovanni Melina, Augustus Panton, Carlo Pizzinelli, Emma Rockall, and Marina Tavares. "Gen-AI: Artificial Intelligence and the Future of Work," 2024. <https://www.imf.org/-/media/Files/Publications/SDN/2024/English/SDNEA2024001.ashx>.

¹³ "A Service of Zbw." n.d. <https://www.econstor.eu/bitstream/10419/172894/1/dp3017.pdf>.

Ethical and Regulatory Challenges

The ethical implications of AI and robotics in diplomacy raise complex questions. Issues such as AI bias, autonomous weapons, and data privacy demand international cooperation and regulatory frameworks to ensure responsible and ethical use of these technologies in diplomatic contexts.

Establishment of Collaborative Initiatives and Alliances

International collaborations and alliances are formed to address shared challenges and opportunities presented by AI and robotics. Initiatives like the Global Partnership on AI (GPAI) and regional alliances promote responsible AI development, facilitate information sharing, and foster diplomatic cooperation.

The Global Partnership on Artificial Intelligence (GPAI)

The Global Partnership on Artificial Intelligence (GPAI)¹⁴ is a collaborative initiative designed to bridge the gap between AI theory and practical application. It supports advanced research and practical activities on AI-related priorities. GPAI is founded on a collective commitment to the OECD Recommendation on Artificial Intelligence. It unites experts and stakeholders from science, industry, civil society, governments, international organizations, and academia to promote international cooperation in the field of AI.

US-EU Trade and Technology Council (TTC)

In 2022, the US and the European Union (EU) signed the Trade and Technology Council (TTC) Agreement¹⁵, focusing on enhancing the semiconductor industry's cross-border flow of goods and services. The agreement aims to address vulnerabilities in the semiconductor supply chain and anticipate future chip shortages. It employs two main strategies: coordinating chip investments to

¹⁴ “About - GPAI.” n.d. Www.gpai.ai. <https://www.gpai.ai/about/>.

¹⁵ CRS), Congressional Research Service, ed. n.d. <https://crsreports.congress.gov/product/pdf/IF/IF12575#:~:text=The%20U.S.%20DEU%20Trade%20and%20democratic%2C%20market%20oriented%20values.>

avoid a detrimental subsidy race and developing an early warning detection system for supply chain disruptions.

By sharing information on planned fab investments and target companies, the US and EU hope to balance semiconductor manufacturing capacity, with the EU focusing on automotive chips and the US on leading-edge nodes. The agreement also includes cross-border information dissemination and potential preferential treatment for fabless companies.

The Quad Semiconductor Supply Chain Initiative¹⁶

The Quadrilateral Security Dialogue (Quad), comprising India, Australia, Japan, and the US, expanded its focus in 2021 to include semiconductor collaboration due to the Covid-19 pandemic's exacerbation of global chip shortages. At the September 2021 summit, the Quad leaders announced the 'Quad Semiconductor Supply Chain Initiative' to map capacity, identify vulnerabilities, and enhance supply-chain security for semiconductors.

This initiative aims to ensure a competitive market, prevent monopolies, and fortify the supply chain against future disruptions. Each member contributes uniquely: the US leads in chip design and owns essential EDA software licenses, Japan excels in producing silicon wafers and semiconductor materials, Australia supplies critical minerals like silica, gallium, and India provides valuable human resources for chip design services.

Other Major Key Players in the Semiconductor Race

- **Japan:** Holds a dominant position in advanced semiconductor manufacturing, boasting a significant 50 percent share of critical materials essential for chip production, including photoresist, silicon wafers, and photomasks.
- **South Korea:** Despite being a major silicon producer, South Korea faces challenges due to its limited rare metal reserves. The country heavily relies on China for rare metal imports, prompting efforts to bolster its stockpiles of critical metals such as nickel, cobalt, and rare earth metals.

¹⁶ "A Matter of Trust: How New Delhi Sees the Quad Tech Partnership," Orfonline.org. Accessed June 6, 2024. <https://www.orfonline.org/expert-speak/a-matter-of-trust>.

- **United States:** While ranking fifth in global silicon production, the United States leads in semiconductor research and development, spearheading cutting-edge innovations. In 2022, the country produced 265,000 metric tons of silicon.
- **Russia:** Leveraging its rich silicon reserves, Russia significantly increased its silicon production to 620,000 metric tons in 2023, positioning itself as a notable player in the global silicon market.

Case Study: China-Taiwan's Silicon Warfare



Source: Asia Society

China and Taiwan's strategic struggle in the semiconductor sector has been quite a contentious issue in the modern contemporary geopolitics. It began to grow significantly in the early 2000s, when Taiwan emerged as a worldwide leader in chip production, posing a challenge to China's ambitions in the technology industry. Taiwan's semiconductor sector, spearheaded by enterprises such as TSMC (Taiwan Semiconductor fabrication Company), has become a vital part of worldwide supply chains, particularly in sophisticated chip fabrication.

The Biden administration has not officially acknowledged China's dependency on Taiwan, which has been referred to as the island's "silicon shield" against a Chinese invasion. With bipartisan congressional support, the administration has broadened the scope of sweeping security sanctions

on exports of cutting-edge American semiconductor technology to Chinese companies and military entities, as well as launched a major national effort to rebuild domestic chip fabrication capability.

China depends on the Taiwan Semiconductor Manufacturing Company (TSMC) to provide 70 percent of the chips needed to feed its world-leading consumer electronics industry. At the same time, TSMC also fabricates under contract 92 percent of the most advanced chips designed by U.S. semiconductor companies which collectively earn about 47 percent of total global semiconductor and other integrated circuit (IC) revenue.¹⁷

Currently, tensions between China and Taiwan in the semiconductor sector remain strenuous. China has made significant investments in its own semiconductor sector in order to lessen dependency on Taiwanese technology and demonstrate its technical independence. Taiwan, on the other hand, continues to develop and enhance its semiconductor capabilities in order to preserve its position as a worldwide chip market leader. This competition is a major component of China-Taiwan geopolitical tensions, with consequences for global technological leadership and supply chain security.

Conclusion

Artificial intelligence and robots have become crucial instruments in defining global geopolitics, influencing not just conventional realms such as national defense, but also economic dynamics and diplomatic strategy. Their impact goes beyond boundaries, affecting how states engage, trade, and collaborate, altering power relations on the global arena. Policymakers, technicians, and international stakeholders must work together to realize the potential of AI and robots for the benefit of all mankind. It is critical that these technologies be developed and used ethically, with an emphasis on fairness, transparency, and accountability.

The regional and international alliances like —The Quad Semiconductor Supply Chain Initiative, the Chip4 Alliance, US-EU Trade and Technology Council (TTC), Global Partnership on AI (GPAI)¹⁸ etc. should come forward with more dynamic policies regarding ethical usage of robots

¹⁷ Cronin, Richard, “Semiconductors and Taiwan’s ‘Silicon Shield’ • Stimson Center.” Stimson Center. August 16, 2022. <https://www.stimson.org/2022/semiconductors-and-taiwans-silicon-shield/>.

¹⁸ “India in the Era of ‘Silicon Diplomacy,’” Orfonline.org. <https://www.orfonline.org/research/india-in-the-era-of-silicon-diplomacy>.

and AI to cope with the everchanging dynamics of the geopolitics of the globe. By fostering collaboration and dialogue among diverse stakeholders and leveraging these initiatives, policymakers, technologists, and international stakeholders can work together to ensure that AI and robotics contribute positively to global stability, prosperity, and sustainable development in the years to come.