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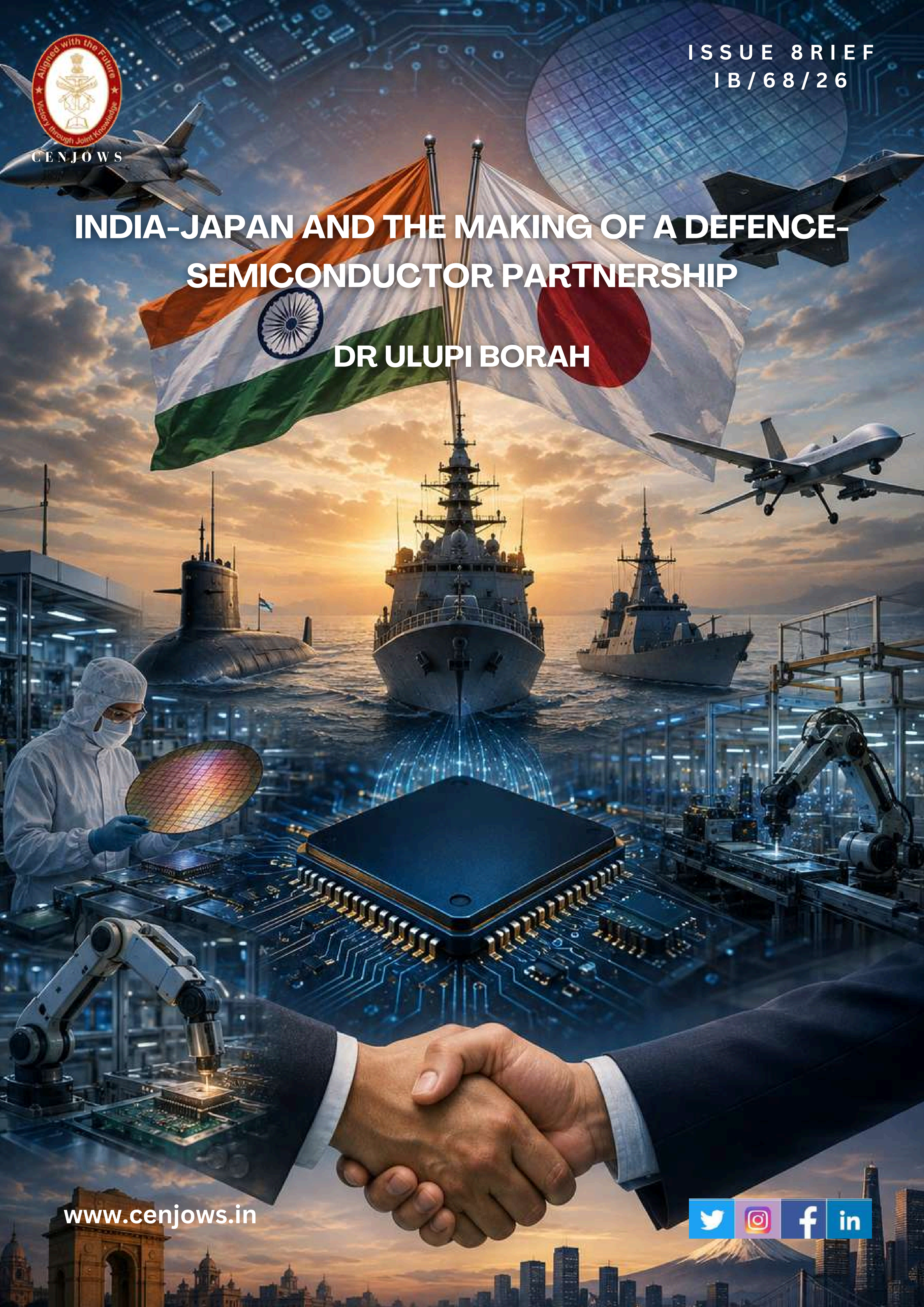

INDIA-JAPAN AND THE MAKING OF A DEFENCE-SEMICONDUCTOR PARTNERSHIP

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Abstract

India and Japan bring complementary strengths to the global semiconductor value chain. Japan's enduring expertise in materials, equipment, and back-end processing meets India's design talent, fabrication ambition, and expanding policy architecture, including the Design Linked Incentive (DLI) Scheme, the Production Linked Incentive (PLI) Scheme, the India's Semiconductor Mission (ISM) 2.0, and the National Critical Mineral Mission (NCMM) ensures that neither country enters this partnership from a position of established dominance. Japan's competitive displacement from a once-dominant position and India's decades of policy inconsistency implies that their relationship rests on genuine complementarity rather than dependency. This chapter traces how that relationship has matured rapidly, from a 2023 Memorandum of Cooperation into a full economic-security architecture by 2026, while its defence-specific dimension remains underdeveloped. Drawing on rare earth supply chains, private-sector partnerships, and platform-level defence cooperation, the chapter identifies intellectual property sharing as one of the factors separating this civilian depth from its latent military-application potential and proposes concrete policy measures to close that gap.

INTRODUCTION

A fighter jet's radar, a warship's electronic warfare suite, and a missile's terminal guidance system have one thing in common that has nothing to do with steel, fuel, or explosives. Each depends on a semiconductor chip small enough to fit in a matchbox, and each would fail without it. This is the quieter shift running underneath modern military technology. Platforms are still built from metal and composite, but their actual combat performance, how fast they sense a threat, how precisely they track it, and how reliably they respond under jamming or extreme heat, is decided almost entirely at the chip level.

Silicon, the material that built the entire consumer electronics industry, was never designed for this job. It struggles at the frequencies, voltages, temperatures, and radiation levels that defence systems routinely operate under, and it degrades or fails outright in conditions a radar or a satellite payload cannot avoid. This single limitation, largely invisible outside specialist circles, is what has pushed compound semiconductors from a niche materials-science topic into a genuine question of military capability.[1]

This has driven the rise of compound semiconductors, Gallium Nitride (GaN), Gallium Arsenide (GaAs), Silicon Carbide (SiC), Indium Phosphide (InP), and Mercury Cadmium Telluride (HgCdTe), as the true backbone of high-performance defence archite thin this context that India-Japan collaboration acquires strategic significance. Unlike India's partnerships with the United States or Taiwan, which centre on fabrication scale, the India-Japan relationship is built on complementarity: Japan's enduring strength in semiconductor materials, equipment, and back-end processing meets India's design talent, manufacturing ambition, and political will under Atmanirbhar Bharat and the India Semiconductor Mission.[2] Since the 2023 Memorandum of Cooperation (MoC), this partnership has matured rapidly into a full economic-security architecture by 2026. What remains underdeveloped, however, is its defence-specific dimension, the strategic gap this chapter sets out to address.

HISTORICAL TRAJECTORIES: DECLINES AND COMEBACKS

Although Japan and India followed markedly different paths in the evolution of their semiconductor industries, both now face a common strategic challenge that necessitates active state-led reconstruction of industrial capacity. In Japan's case, the decline of its semiconductor industry was driven not by a loss of technological capability but by competitive displacement in an increasingly globalised and specialised semiconductor ecosystem.

By 1986, three Japanese firms, NEC, Toshiba, and Hitachi, held a combined global market share exceeding 50 percent, driven largely by dominance in DRAM manufacturing.[3] This position was undermined by a combination of external and internal factors. U.S.-imposed export restrictions on Japanese semiconductor products following bilateral trade disputes, the appreciation of the yen after the 1985 Plaza Accord, and a structural failure to transition from an integrated-device-manufacturing (IDM) model toward the fabless-foundry architecture all played a role, one that South Korea and Taiwan subsequently used to their advantage.[4] The cumulative effect reduced Japan's global semiconductor market share to approximately 10 percent by 2023, with no Japanese firm currently ranked among the top ten global semiconductor companies by revenue.[5] Notably, this decline occurred despite Japan retaining, and in several segments strengthening, its position in upstream materials and equipment.

India's trajectory, by contrast, is one of policy inconsistency rather than displacement from an established position. Early state involvement through Bharat Electronics Limited (BEL) and Hindustan Aeronautics Limited (HAL) in the 1960s established a limited defence-electronics base, and the Semiconductor Complex Limited (SCL), created under the Rajiv Gandhi government, represented India's first dedicated fabrication effort.[6] A fire at the SCL facility significantly damaged this capability, and subsequent policy responses were sporadic. The first semiconductor policy was introduced only in 2007, with limited implementation until the Modified Semiconductor Policy of 2021-22 and the establishment of the India Semiconductor Mission (ISM) in December 2021, which marked a more sustained institutional commitment.[7]

The comparative significance of these two trajectories lies less in their differences and more in their present convergence. Both countries are engaged in simultaneous, state-driven reconstruction efforts. Japan is attempting to recover relevance in a market it once led, and India is attempting to establish a manufacturing base it has historically lacked. Neither country enters bilateral collaboration from a position of established dominance, which removes a common asymmetry that complicates many technology partnerships and creates conditions more conducive to genuine complementarity rather than dependency.

JAPAN’S POSITION: MATERIALS DEPTH, POLICY BACKING AND THE COMPOUND-SEMICONDUCTOR PIVOT

Rather than treating this partnership through a generic "complementarity" label, it is more precise to describe the India-Japan semiconductor relationship as a trade between upstream material depth and downstream design-and-manufacturing scale. These represent two positions that rarely coexist within a single national semiconductor ecosystem, with Japan and India occupying almost perfectly complementary ends of the spectrum.

Japan’s position remains concentrated overwhelmingly in the upstream segments of the semiconductor value chain. Japanese firms account for approximately 56 per cent of the global semiconductor-materials market and around 32 per cent of the semiconductor-production-equipment market.[8] Their strength extends across specialised areas such as coater/developer equipment, silicon wafers, photoresists and advanced semiconductor chemicals, with companies including Tokyo Electron, SCREEN Holdings, Shin-Etsu Chemical, SUMCO, JSR, Tokyo Ohka Kogyo and Fujifilm occupying important positions in these segments. Japan is also reported to hold at least 60 per cent of the global market in nearly 70 categories of advanced semiconductor materials, while Tokyo Ohka Kogyo alone accounts for approximately 25 per cent of the global photoresist market.[9] These figures demonstrate that Japan’s strategic importance lies less in overall chip-manufacturing volume than in its continued control over highly specialised materials, equipment and process technologies that remain indispensable to semiconductor production. This figure, however, measures global production and supplier share, which companies manufacture the material, and should not be confused with domestic consumption revenue, the value of photoresist used within a country's own wafer fabs.

By the latter metric, Japan’s domestic market remains relatively modest, valued at approximately USD 277.4 million in 2024, or around 5.6 per cent of global photoresist revenue.[10] This reflects the outward-orientated character of Japan’s semiconductor-materials industry, with a substantial share of domestic production supplying fabrication facilities in Taiwan, South Korea, China and other major manufacturing centres rather than being consumed within Japan itself.

Japan’s upstream strength extends well beyond photoresists. Shin-Etsu Chemical is the world’s largest producer of silicon wafers, with ultra-high-purity manufacturing standards that set an important global benchmark.

In chemical mechanical planarisation (CMP) consumables, Resonac and Fujimi remain indispensable suppliers of low-defectivity slurries and abrasives. While a narrower but equally critical niche is held by Toho Koki Seisakusho, which has established itself as a global leader in CMP pad-groove processing machines and pad inspection tools. This is the precision equipment used to manufacture and maintain the polishing pads onto which Resonac's and Fujimi's slurries are applied.[11]

Shin-Etsu has begun pivoting towards Qromis Substrate Technology (QST™), an engineered substrate platform that enhances the performance and reliability of GaN-based semiconductor devices. [12] More broadly, Japan's semiconductor-materials industry is positioning itself for the transition towards compound semiconductors required for next-generation defence electronics, with SiC and GaN materials markets projected to grow at a compound annual growth rate (CAGR) of around 22 per cent, compared with approximately 4 per cent for conventional silicon.[13] Government backing reinforces that Japan's Ministry of Economy, Trade and Industry (METI) allocated JPY 1.23 trillion (approximately USD 8.7 billion) for semiconductor infrastructure in FY2026 alone, with JPY 400 billion (approximately USD 2.8 billion) ring-fenced specifically for wafer capacity and materials R&D.[14]

The Economic Security Promotion Act (ESA, 2022) as the Policy Umbrella

Japan's materials and equipment dominance is not simply a market outcome; it is increasingly backed by a dedicated legal framework. Enacted in May 2022, the ESA designates semiconductors, alongside rare earths and eleven other categories, as "specified critical materials" requiring formal supply-chain stabilisation plans and empowers the state to subsidise private-sector stockpiling, diversification, and domestic production capacity on national-security grounds rather than commercial logic alone.[15] This is the legal basis on which METI's FY2026 allocation, noted above, is authorised, meaning Japan's materials firms are not merely responding to market demand from India but operating within a state-directed resilience mandate that treats semiconductor materials as a strategic asset class.

The Post-2010 Rare-Earth Strategy as the Institutional Template

Japan's current approach to materials security did not originate with the ESA; it was forged during the 2010 rare-earth export embargo imposed by China amid the Senkaku Islands dispute. Tokyo's response, a JPY1.2 billion (approximately USD 7.4 million) domestic programme built on five pillars: subsidising equipment investment to reduce REE consumption, funding substitute-material research, building recycling infrastructure, acquiring equity stakes in overseas mines (notably in Australia), and establishing strategic stockpiles, remains the operative template for how Japan is likely to structure any future materials-security arrangement with India.[16] The implication for this chapter is direct: Japanese cooperation on defence-relevant compound-semiconductor materials with India will most plausibly be routed through ESA-backed, state-coordinated mechanisms rather than negotiated purely commercially between individual firms.

INDIA'S POSITION: DESIGN TALENT, POLICY PUSH, AND THE FABRICATION GAP

India's position in the value chain sits at the opposite pole from Japan's and is best understood not as a single strength but as three converging assets: a large design workforce, an aggressive policy architecture built specifically to convert that workforce into fabrication capacity, and a strategic fabrication base that remains, at present, capability-proven but scale-poor.

Design talent as the starting asset

India possesses roughly 20 percent of the world's semiconductor design engineers, producing thousands of chip designs annually, a workforce advantage the National Policy on Electronics 2019 explicitly sought to convert into a "vibrant semiconductor chip design ecosystem".[17] This talent base is the foundation on which India's entire semiconductor strategy rests, since design captures the highest value in the chip value chain: it contributes up to 50 percent of value addition and 20-50 percent of a chip's

Bill of Materials (BOM) cost, even though design work itself requires comparatively little capital infrastructure relative to fabrication.[18]

The Modified Semiconductor Policy (2021-22) and ISM 2.0 as the Umbrella Framework

India's semiconductor incentive architecture did not emerge scheme by scheme but was consolidated under the Modified Semiconductor Policy of 2021-22, which established the incentive structures for ATMP, chip design, and manufacturing that the DLI and PLI schemes below implement in practice.[19] By July 2026, this architecture had matured into ISM 2.0, which the India-Japan Joint Declaration on Economic Security Cooperation explicitly names as the designated channel through which Japanese companies are invited to participate, alongside India's Special Economic Zones.[20] This is a materially important detail for this chapter: it means Japanese firms are not being asked to navigate India's semiconductor policy landscape independently but are being directed toward a specific, government-endorsed entry point.

The Design-Linked Incentive (DLI) Scheme

The DLI Scheme is the specific instrument built to monetise this talent advantage. It was launched in December 2021 under the broader INR 76,000 crore (approximately USD 8.57 billion) ISM. The scheme is implemented by the Ministry of Electronics and Information Technology (MeitY), with the Centre for Development of Advanced Computing (C-DAC) acting as the nodal agency. It is structured around three components. The first is Chip Design Infrastructure Support, which includes a dedicated India Chip Centre offering Electronic Design Automation (EDA) tools, Intellectual Property (IP) cores, and Multi-Project Wafer (MPW) fabrication access. The second is the Product Design Linked Incentive. The third is the Deployment-Linked Incentive. Under this structure, the scheme offers up to INR 15 crore (approximately USD 1.7 million) in product development support per company. It also offers a Deployment-Linked Incentive of six percent of net sales turnover for companies with turnover up to INR 1,500 crore (approximately USD 174 million) for five years from the first commercial deployment.[21] As of early 2026, results are measurable; supported companies have filed ten patents, completed sixteen chip-design tape-outs, fabricated six semiconductor chips, developed over 140 reusable IP cores, and trained more than 1,000 specialised engineers, with several DLI-backed projects targeting defence-adjacent applications directly, including drone detection and aerospace-grade Application-Specific Integrated Circuits (ASICs).[22]

The Modified Production-Linked Incentive (PLI) Scheme

It operates downstream, targeting fabrication. It extends fiscal support of up to 50 percent of project cost on a pari-passu basis to approved applicants establishing semiconductor fabs, compound semiconductor fabs, and Assembly, Testing, Marking, and Packaging (ATMP) / Outsourced Semiconductor Assembly and Test (OSAT) units, a subsidy rate calibrated to match or exceed the US CHIPS Act and EU Chips Act.[23] 2026 alone saw the inauguration of the Micron ATMP facility, the Kaynes Semicon plant, and the CG Semi OSAT facility, all in Sanand, Gujarat, alongside the groundbreaking of India's first advanced 3D semiconductor packaging unit in Odisha, explicitly billed as a boost to AI, 5G, and defence technology.[24]

The National Critical Mineral Mission (NCMM)

The National Critical Mineral Mission was launched in 2025 with a seven-year outlay of INR 34,300 crore (approximately USD 4.1 billion), complementing India's broader semiconductor development initiatives. The mission mandates the Geological Survey of India (GSI) to undertake 1,200 exploration projects between FY2024-25 and FY2030-31.[25] NCMM governs India's domestic capacity to supply Rare Earth Element (REE) dependent materials, like cerium-based CMP slurries among them, that any future scale-up of SCL's fabrication line, or a defence-specific compound-semiconductor line, would require. Without the National Critical Mineral Mission's materials pipeline maturing in parallel, India's semiconductor ecosystem would continue to rely on imported REE-derived inputs. This would merely shift foreign dependence from manufacturing equipment to critical raw materials, rather than eliminating it.

Where India's Actual Defence-Fabrication Capability Sits

Unlike the design-and-assembly ecosystem described above, India's only integrated device manufacturing facility with a standing mandate for strategic production is the Semi-Conductor Laboratory (SCL) in Mohali, Punjab. It is an autonomous body under

MeitY and India's sole facility dedicated specifically to chips for strategic and defence applications.[26] SCL currently operates an 8-inch wafer fabrication line on a 180-nanometre (nm) Complementary Metal-Oxide-Semiconductor (CMOS) process and has supplied radiation-tolerant processors for ISRO missions, including the Mars Orbiter Mission and Chandrayaan-3, alongside custom ASICs for DRDO missile-guidance and radar-processor applications.[27] The technology gap is significant. SCL continues to manufacture chips using a 180 nm process, whereas leading commercial semiconductor manufacturers have advanced to 14 nm and below. The challenge was compounded by a devastating fire in 1989, described by some officials as an act of sabotage, which disrupted India's strategic semiconductor programme and set back its indigenous chip-manufacturing capabilities by more than a decade.[28] An INR 4,000-4,500 crore (approximately USD 470-525 million) modernisation programme is currently underway, with bidders including Tata Semiconductor and Israel's Tower Semiconductor. The upgrade is expected to introduce advanced semiconductor manufacturing technologies, significantly enhancing SCL's capability to produce strategic and defence-grade chips.[29] This is precisely the juncture at which Japanese equipment and materials suppliers, already engaged through Tokyo Electron's Dholera partnership, could be drawn into SCL's revamp specifically, rather than only into India's civilian fab ecosystem, since SCL's mandate is the one node in India's entire semiconductor architecture built explicitly for strategic and defence output rather than commercial scale.

The Bilateral Institutionalisation Track (2024-2026) and the Unresolved IP Question

Having established each country's domestic capabilities and policy architecture separately, it is necessary to trace how these two parallel systems have been formally connected and where that connection remains incomplete.

The Institutionalisation Phase.

The India-Japan semiconductor relationship moved from a single foundational MoC into a genuine multi-track bilateral system between 2024 and 2026. November 2024 saw the launch of the India-Japan Dialogue on Economic Security at the Vice Foreign Minister/Foreign Secretary level, the first dedicated ministerial-track forum for the relationship.[30] Through 2025, this architecture strengthened further. The Digital Partnership 2.0 was renewed. Mizuho Bank signed an MoC with the Government of Gujarat in October 2025 to support Japanese semiconductor investment specifically within the state. Japan’s Ministry of Economy, Trade and Industry (METI) and India's Ministry of Mines signed a separate MoC on mineral resources that August. And India's Geological Survey of India (GSI) concluded its own MoC with Japan's JOGMEC on exploration technology exchange.[31] This culminated in the July 2026 Joint Declaration on Economic Security Cooperation, the capstone document of the relationship to date. The Declaration named semiconductors as one of five priority sectors, alongside critical minerals, ICT, clean energy, and pharmaceuticals. It also explicitly welcomed Japanese participation in ISM 2.0 and India's Special Economic Zones.[32] The first joint working group under the 2025 MoC in the field of mineral resources between India's Ministry of Mines and Japan's METI was convened in April 2026. It marked the emergence of a dedicated critical-minerals cooperation track with its own implementation mechanism, complementing but remaining institutionally distinct from the semiconductor-specific dialogue.[33]

The Intellectual Property Gap

Although the emerging India-Japan semiconductor architecture rests on the 2023 MoC, Japan’s ESA-backed strategy, ISM 2.0, and the July 2026 India-Japan Joint Declaration, a framework of binding technology-transfer commitments is yet to evolve. This is not an oversight; it reflects a genuine and persistent asymmetry between the two countries' underlying incentives. Japanese firms remain cautious about sharing intellectual property because of the substantial R&D investment behind their technological lead. India, however, seeks to move beyond licensed production towards genuine co-development.[34] Although this asymmetry can be accommodated commercially in the civilian semiconductor sector, it becomes considerably more consequential in the defence domain, where strategic capability depends not merely on manufacturing capacity but on access to protected process technologies, fabrication know-how and intellectual property.[35]

The implications are particularly evident in advanced defence platforms. Modern naval vessels, integrated sensor masts, electronic warfare suites, AESA radars and precision-guided weapon systems derive much of their operational capability from

GaN and GaAs-based High Electron Mobility Transistors (HEMTs) and Monolithic Microwave Integrated Circuits (MMICs,) which determine radio-frequency power output, thermal management, signal processing and electronic warfare resilience.[36] Consequently, collaborative initiatives such as the UNICORN co-development programme and any prospective transfer of the Mogami-class frigate inevitably extend beyond platform integration to the semiconductor technologies embedded within them. Without trusted mechanisms for component-level technology transfer and intellectual property sharing, platform-level cooperation risks remaining confined to licensed production rather than evolving into genuine strategic co-development.[37]

Addressing this limitation requires a framework that neither the 2023 MoC nor the 2026 Joint Declaration presently establishes. There is a requirement of a dedicated government-to-government intellectual property-sharing mechanism specifically designed for dual-use semiconductor technologies. Such a mechanism could draw upon the principles underpinning the US-Japan UPWARDS partnership[38] while incorporating an explicit security-classification architecture that distinguishes civilian semiconductor collaboration from defence-relevant compound-semiconductor research and manufacturing.[39] Beyond facilitating collaboration, the framework could institutionalise two critical mechanisms. First, it could establish pre-approved categories of compound-semiconductor materials, fabrication equipment and process technologies for transfer to designated Indian defence-linked facilities. This could reduce dependence on transaction-by-transaction export licensing. Second, it could introduce joint intellectual property ownership for technologies developed collaboratively, ensuring that Indian partners become genuine co-developers rather than remaining perpetual technology licensees. Such an institutional architecture would transform India-Japan semiconductor cooperation into a long-term strategic technology partnership.[40]

Rare Earths and Advanced Materials as the Hidden Layer

Beneath the visible layer of fabs and design incentives sits a less-discussed but equally decisive layer, i.e., the REEs and advanced materials. They feed both semiconductor manufacturing and defence hardware simultaneously. Cerium oxide for wafer polishing and REE-derived materials used in photoresists and EUV masks link

Japan's semiconductor materials leadership directly to a rare earth supply chain it does not control.[41]

India's position here is a genuine paradox. It holds the world's third-largest rare earth reserves, estimated at 6.9 million metric tonnes of rare earth oxides, yet produces less than one percent of global REE output.[42] The constraints are threefold. First, regulatory constraints arise because REE-bearing monazite sands contain high levels of thorium and therefore fall under India's Atomic Energy regulatory regime. Second, technological constraints persist because India lacks industrial-scale separation and purification infrastructure to convert raw ore into high-purity oxides. Third, capital constraints remain significant, as developing such infrastructure requires investment on a scale that India's REE sector has not yet attracted.[43]

Japan, meanwhile, has been here before. Its 2010 response to China's rare-earth embargo, equipment subsidies, substitute-material R&D, recycling infrastructure, overseas mine stakes, and stockpiling offers India a partial template.[44] Despite its global leadership in rare earth processing, Japan remains heavily dependent on Chinese supplies. China accounted for 63 percent of Japan's rare earth metal imports by volume in 2024 and supplied all of its heavy rare earths.[45] The relationship is therefore one of mutual strategic dependence rather than one-way assistance. This is already reflected in Toyota Tsusho's partnership with Indian Rare Earths Limited (IREL), which has operated since 2012 through its subsidiary, Toyotsu Rare Earths India, processing Indian rare earth oxides for export to Japan.[46] In fact, the Andhra Pradesh rare earth refining project, advanced under the 2026 Summit's economic security track, represents the current-generation extension of that same model.[47]

Private Sector and Industrial Anchors

- The government architecture described above has produced a genuine wave of private-sector activity. Some of the major industry initiatives are highlighted below:
- **Renesas** invested in CG Power's ATMP project in Sanand, Gujarat, supporting mass production from 2026. It separately holds MoUs with the Centre for Development of Advanced Computing (C-DAC) and IIT Hyderabad on semiconductor research, talent development, and startup ecosystems.[48]

- **Tokyo Electron (TEL) and Tata Electronics** launched a strategic partnership under which TEL is opening an office in Dholera Industrial Park, Gujarat. It is supporting Tata Electronics' new front-end fabrication facility and announced a separate HR development ecosystem with local businesses and educational institutions in April 2026.[49]
- **Fujifilm India** announced its intent to build a semiconductor materials manufacturing facility at Dholera. It has an MoU signed with the Government of Gujarat in June 2026, and operations are envisaged around 2028.[50]
- **ROHM** signed an MoU with Tata Electronics in December 2025. It aspires to develop power semiconductor manufacturing using ROHM's back-end capabilities. It also signed a second MoU with Suchi Semicon in March 2026, exploring back-end outsourcing and mass production of power semiconductors and ICs. Power semiconductors carry direct defence relevance, given SiC's role in high-voltage power electronics for naval propulsion, aircraft power systems, and radar architectures.
- **MinebeaMitsumi Inc.** is conducting a feasibility study on India's semiconductor and component supply chain, alongside an MoU with the Government of Tamil Nadu. This is for manufacturing and R&D facilities for high-voltage power semiconductors used in railway applications.
- **Toho Koki Seisakusho** is a global leader in CMP pad-groove processing machines, which have been discussed earlier. Notably, Toho Koki remains a significant supplier of this equipment to China's own semiconductor industry, underscoring that this is not a capability China has managed to replicate domestically and reinforcing Japan's genuinely irreplaceable position in this specific equipment niche.
- **Mizuho Bank** was commissioned by METI to design a "master plan" fostering the Japan-India semiconductor industry. It was formalised through an October 2025 MoC with the Government of Gujarat supporting Japanese semiconductor investment in the state.
- **Horiba** established a semiconductor unit in the Nagpur industrial estate, Maharashtra.[51]

It is important to note, however, that nearly all of these projects are framed as commercial rather than defence initiatives. OSAT lines, materials facilities, and power semiconductors for railways sit squarely within the civilian, automotive, and industrial domains. This does not diminish their significance. If anything, these partnerships are playing a foundational role. They are building the industrial base of fabrication capacity, materials supply, and a skilled workforce. Any future defence-specific overlay will eventually need to rest on this foundation.

CHALLENGES AND STRATEGIC GAPS

Several structural challenges temper the pace of this cooperation. Some of them have been discussed below:

- **Japanese Caution on Intellectual Property.** As discussed above, Japanese firms continue to assess large-scale investments carefully, and India is responding with concrete measures rather than policy statements alone. These include single-window investor support, land and capital-expenditure subsidies at hubs like Dholera, and eased Special Economic Zone (SEZ) land requirements aimed at strengthening investor confidence and attracting long-term capital.[52]
- **Capital Intensity Against an Uncertain Return.** Semiconductor materials and equipment investment requires capital commitments measured in billions of dollars. Japanese firms remain cautious about committing at this scale. However, currently India focuses on the track record on returns and pushing for further progress along with its regulatory predictability. Project timelines, too, remain a concern for investors weighing where to place long-term capital.[53]
- **Institutional and Bureaucratic Mismatch.** India's NCMM and Japan's ESA 2022 operate on different institutional clocks. Their approval processes do not match. Their funding cycles run on separate schedules. Even the degree of centralisation differs between the two systems. The result is that joint projects could take longer to structure than they should, even when both sides want the same outcome.[54]
- **Competing Regional Pulls.** Japan's "China+1" diversification strategy is not centred on India alone. It has already channelled significant investment into countries such as Vietnam and Thailand, which offer cost-competitive labour and more established manufacturing and supply-chain ecosystems. As a result, India competes directly with these regional economies for Japanese investment

in semiconductor materials and equipment, making sustained policy reforms and an attractive investment environment essential rather than assuming that Japanese capital will naturally flow to India.[55]

RECOMMENDATIONS

Drawing together the analysis above, five policy measures would close the gap between India-Japan cooperation's current civilian depth and its latent military-application potential.

- **A Defence-Specific Carve-Out Within the DLI and PLI Schemes**. The DLI and PLI schemes have already proven their ability to mobilise investment, with the PLI ecosystem alone drawing over USD 20 billion across 800-plus projects.[56] What both schemes lack is a defence-specific tier. Right now, a Japanese firm working on compound-semiconductor design in GaN, GaAs, or SiC gets treated the same as one making a consumer chip; even though defence chips are produced in small batches for a single government buyer, they must meet stricter military qualification standards and involve export-control sensitivities that consumer electronics do not face.[57] A defence-specific carve-out would extend DLI-style design support and EDA access specifically to defence-tied compound semiconductor work, while calibrating PLI fiscal support to the slower cost-recovery timelines defence electronics require. A defence-specific carve-out would extend DLI-style design support and EDA access specifically to defence-tied compound semiconductor work, while calibrating PLI fiscal support to the slower cost-recovery timelines defence electronics require. This would offer a conducive, government-endorsed platform not only for established players like Tokyo Electron and Renesas, but also for the wider pool of Japanese materials firms, equipment suppliers, and semiconductor startups looking to enter India's defence ecosystem, giving them a clearer lane instead of the uncertain, deal-by-deal exposure they currently face.
- **A Two-Tier Bilateral IP-Sharing Protocol for Dual-Use Technology**. Rather than a single umbrella agreement, this protocol should function on two distinct

tiers. Tier one would cover civilian design collaboration, governed by standard joint-patent and licensing terms, similar in spirit to the US-Japan UPWARDS partnership.[58] Tier two would apply specifically to defence-relevant compound-semiconductor co-development, GaN and GaAs MMICs for radar and electronic warfare among them, it would require a joint MeitY-METI clearance committee empowered to pre-approve categories of technology transfer in advance, rather than clearing each transaction individually. This committee could sit within the existing Semiconductor Policy Dialogue mechanism already established under the 2023 MoC, giving it institutional footing without creating an entirely new bureaucracy.[59]

- **Harmonisation of NCMM and ESA 2022 Priorities into a Joint Critical-Minerals-for-Defence Protocol**. Several minerals on India's critical list under the NCMM are tied to missile guidance systems, aircraft, and satellite technologies.[60] Meanwhile, Japan's ESA 2022 treats these same categories of materials as strategic national-security assets, backed by annual supply-chain stabilisation reviews.[61] A joint protocol would connect these two frameworks by earmarking specific sites, such as the Odisha and Andhra Pradesh monazite belts, for Japanese-backed processing and reserving a share of the output, cerium oxide especially, for India's strategic semiconductor lines rather than the open market. This would give both countries a shared, working mechanism rather than two policies moving in parallel.
- **A Dedicated Japan-Focused Pillar.** Institutionalise a dedicated Japan-focused pillar within any future India Defence Semiconductor Mission. This would provide a formal mechanism for India-Japan cooperation in defence-grade chips, trusted electronics, semiconductor materials, equipment and secure supply chains, while keeping such collaboration distinct from the civilian-orientated ISM 2.0 framework.

CONCLUSION

India-Japan semiconductor cooperation has not been held back by a lack of political will, capital, or institutional architecture; all three exist in abundance by 2026. It now needs to be scaled up at the specific point where civilian semiconductor cooperation diverges from defence-oriented requirements. Every mechanism examined here, the

2023 MoC, ISM 2.0, the DLI and PLI schemes, and the July 2026 Joint Declaration, functions competently for commercial semiconductor collaboration precisely because commercial technology transfer can be resolved deal by deal, company by company. Defence-relevant compound semiconductor technology cannot be resolved this way, because export-control regimes and dual-use sensitivities operate at the level of national policy, not corporate negotiation. This is not a minor procedural gap. It is the structural reason why platform-level defence cooperation, UNICORN, the prospective Mogami-class transfer, can proceed in principle while the semiconductor components inside those very platforms remain governed by an entirely separate, less developed, and civilian-oriented track.

DISCLAIMER

ENDNOTES

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