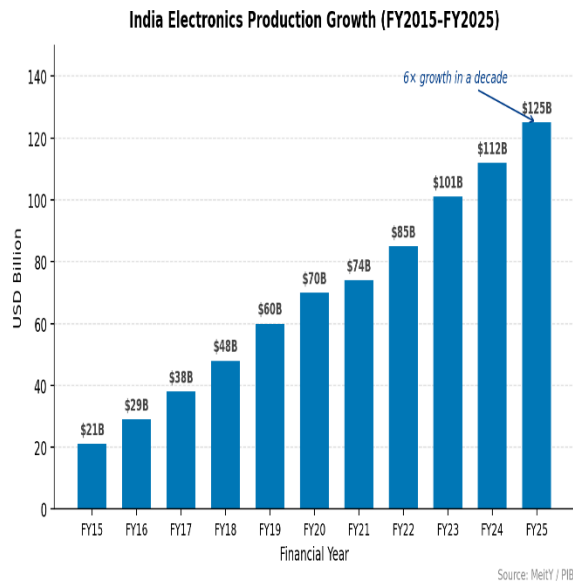


# ESDM Sector in India

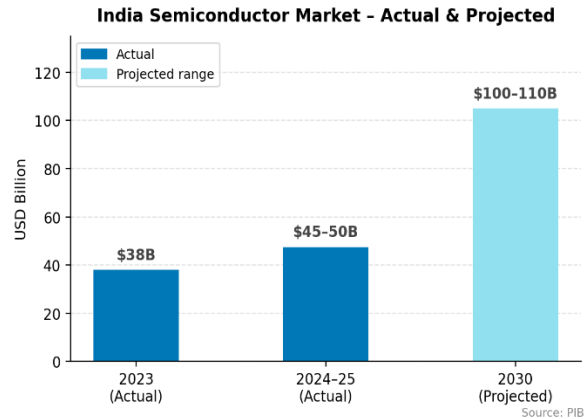
## Regulatory Landscape, Roadmap and Way Forward: A White Paper

The electronics and semiconductor industry presents a significant opportunity for India to capitalise on its inherent economic strengths, such as its R&D focus, robust logistics and supply chain, a readily available talent pool in the tech, AI, cloud computing and IoT space, component raw materials, and a vast pool of MSME component suppliers. Strategically calculated initiatives to exploit these strengths can enable India to emerge as a dominant player in the field and offset the geopolitical risk posed by the concentration of the sector’s supply chain in certain countries.

It is notable that India’s electronics production expanded from USD 21bn (2014–15) to USD 125bn (2024–25), while semiconductor investments under the India Semiconductor Mission (ISM) reached approximately USD 18bn across 10 approved projects.<sup>1</sup>



In a significant indicator of future potential, the size of the Indian semiconductor market grew from about USD 38bn in 2023 to USD 45-50bn in 2024-2025 and is expected to reach USD 100-110bn by 2030.<sup>2</sup>



In this paper we examine the regulatory architecture applicable to India’s electronics system design and manufacturing (ESDM) sector, assess its outcomes, and propose legal and policy reforms to address residual structural constraints.<sup>3</sup>

<sup>1</sup><https://www.newindianexpress.com/business/2025/Aug/12/india-approves-four-new-semiconductor-projects-worth-rs-4600-crore-first-chip-likely-this-year;>  
<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2155456>

<sup>2</sup><https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=154968&ModuleId=3&reg=3&lang=1>

<sup>3</sup><https://evertiq.com/news/2025-10-14-indias-electronic-production-soars-to-140-billion-in-2024-25;>  
<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2183028>

# PART I

## Electronics and Electronics Component Manufacturing: Policy Landscape

### Key Policy Initiatives

#### *National Electronics Policy (2012)*

The National Electronics Policy 2012 targeted a 20% global electronics manufacturing share by 2020, emphasising mobile phones and consumer electronics. However, the objective appears to have been only partially met, as the capital subsidies disbursed post-investment created cash-flow constraints and most foreign OEMs use India primarily as a low-cost assembly hub.

#### *Modified Special Incentive Package Scheme (M-SIPS) (2012-2018)*

M-SIPS provided a 20% capital subsidy for greenfield and 15% for brownfield electronics manufacturing projects, with an additional 5% for SEZ investments. The scheme required two-stage approval through MeitY, with subsidy disbursement only after project completion and statutory auditor verification, creating significant cash-flow constraints for beneficiaries. M-SIPS received applications across 22 states with INR 1.26 lakh crore in committed investment, but its limited contribution to component ecosystem development, led to its replacement by the output-linked PLI framework in 2020.<sup>4</sup>

#### *Production Linked Incentive (PLI) Scheme (2020)*

Launched in April 2020, the scheme covers large-scale electronics manufacturing, cellphones, IT hardware, telecom and networking products,

<sup>4</sup> <https://www.meity.gov.in/offerings/schemes-and-services/details/modified-special-incentive-package-scheme-m-sips-IDNyETMtQWa>

<sup>5</sup> <https://www.rsm.global/india/insights/tax-insights/pli-scheme-in-india;>

[https://www.meity.gov.in/static/uploads/2024/02/Frequently\\_Asked\\_Questions\\_on\\_PLI\\_Scheme.pdf](https://www.meity.gov.in/static/uploads/2024/02/Frequently_Asked_Questions_on_PLI_Scheme.pdf)

LEDs, and other white goods through a 4-6% incentive on incremental sales (against a base year) for a 4-6 year period.<sup>5</sup>

### Disbursement Process:

- Applications are submitted *via* a dedicated portal and undergo initial scrutiny by Ministry of Electronics and Information Technology (MeitY)'s Project Management Agency (PMA) within 15 working days of submission of the application.
- The Approval Committee evaluates applications and recommends approvals to the Competent Authority (Minister-in-Charge), with final selection to be completed within 60 days of the application window closure.
- Incentive claims are filed annually or quarterly post-achievement of incremental sales targets, verified by statutory auditors or independent chartered accountants, and reconciled by the PMA before disbursement.<sup>6</sup>

As of the latest available data, over 800 projects have been approved with a total committed investment of approximately INR 1.97 lakh crore.<sup>7</sup>

#### *Electronics Component Manufacturing Scheme (ECMS) (2025)*

ECMS was launched in April 2025 with an outlay of INR 22,919 crore and a 6-year tenure plus 1-year gestation period (i.e., from FY2025-26 to FY2031-32).<sup>8</sup> The scheme targets upstream components, multilayer PCBs, camera modules, copper laminates, through a hybrid incentive structure combining turnover-linked and capex-

<sup>6</sup>[https://www.meity.gov.in/static/uploads/2024/02/Frequently\\_Asked\\_Questions\\_on\\_PLI\\_Scheme.pdf](https://www.meity.gov.in/static/uploads/2024/02/Frequently_Asked_Questions_on_PLI_Scheme.pdf)

<sup>7</sup><https://www.pib.gov.in/PressNoteDetails.aspx?id=155082&NotelD=155082&ModuleId=3>

<sup>8</sup><https://www.pib.gov.in/PressReleasePage.aspx?PRID=2183028>

linked support.<sup>9</sup> The Union Budget (FY2026–27) has increased the ECMS outlay to INR 40,000 crore from INR 22,919 crore.<sup>10</sup>

### **Incentive Conditions and Process:<sup>11</sup>**

- Beneficiaries receive a 4-6% incentive on incremental turnover over a defined base year, calculated annually for six consecutive financial years.
- For certain target segments (SMD passive components, supply chain components, and capital goods), an additional 25% capital subsidy is provided on eligible capital expenditure.
- Investment thresholds vary by product category: ranging from INR 100mn for supply chain components to INR 5bn for lithium-ion cells.
- The scheme adopts a “*first-come, first-served*” model for incentive distribution, with applications evaluated on an ongoing basis and disbursements proceeding as per approved milestones.<sup>12</sup>

The scheme received an overwhelming response at launch, with applications for investments representing approximately USD 13bn, nearly double the original target.<sup>13</sup> As of the latest available data, MeitY has approved twenty-four ECMS projects with cumulative investments of approximately USD 1.53bn.<sup>14</sup>

### ***Electronics Manufacturing Clusters 2.0 Scheme (EMC 2.0) (2025)***

The Modified Electronics Manufacturing Clusters (EMC 2.0) Scheme was notified in April 2020 with a budgetary outlay of INR 3,762 crore

and provides financial assistance of up to 50% of project cost (capped at INR 70 crore per 100 acres, with an overall ceiling of INR 350 crore per project) as financial assistance, which is disbursed in installments upon achievement of specified milestones.<sup>15</sup>

EMC 2.0 supports plug-and-play infrastructure (power, water, roads, factory sheds) within designated electronics parks. As of November 2025, 11 EMCs and 2 common facility centers across 10 states had been approved, covering 4,399 acres with projected investments of INR 1.46 lakh crore and estimated employment of 180,000 jobs.<sup>16</sup>

The scheme’s decentralised structure allows state governments, state industrial agencies, central/state PSUs, and industrial corridor development corporations to apply as Project Implementing Agencies, giving flexibility to identify and designate suitable industrial areas based on local anchor unit commitments and regional industrial development priorities. Minimum land requirements are set at 200 acres (100 acres for North-Eastern and hill states/UTs), with anchor units committing to acquire at least 20% of saleable land and investing a minimum of INR 300 crore (INR 150 crore in NE/hill regions), ensuring equitable regional distribution of electronics manufacturing capacity.<sup>17</sup>

<sup>9</sup> <https://www.angelone.in/news/market-updates/government-extends-application-deadline-for-electronics-manufacturing-scheme>

<sup>10</sup> <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2221522&reg=3&lang=1>

<sup>11</sup> <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2116172>

<sup>12</sup> <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2174192>

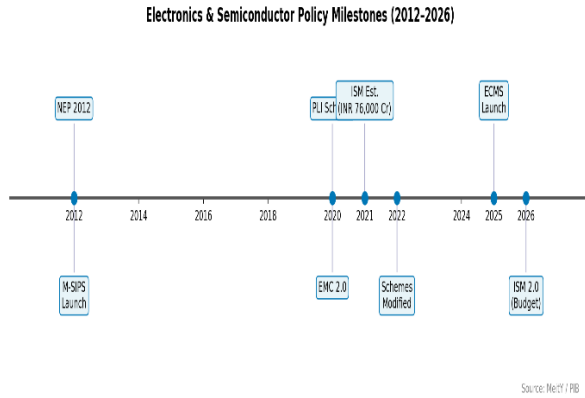
<sup>13</sup> <https://www.india-briefing.com/news/india-ecms-scheme-approvals-electronics-manufacturing-2025-40532.html/>

<sup>14</sup> <https://www.thehindu.com/news/national/government-approves-17-projects-with-7172-crore-investment-under-electronics-component-manufacturing-scheme/article70289911.ece>

<sup>15</sup> <https://www.meity.gov.in/static/uploads/2024/02/Final-Guidelines-of-EMC-2.0-Scheme-31st-May-2020.pdf>

<sup>16</sup> <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2205046&reg=3&lang=1>

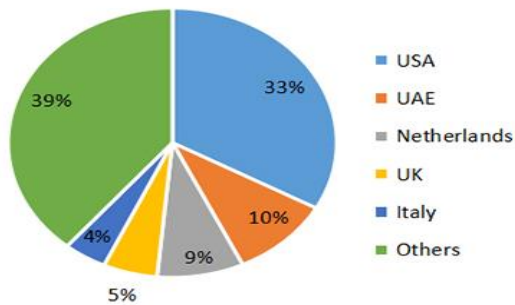
<sup>17</sup> <https://www.meity.gov.in/static/uploads/2024/02/EMC-2.0-Guidelines-Presentation.pdf>



## Increase in Exports

The electronics export market has witnessed an eight-fold increase in the period between 2014-15 and 2024-25, with an additionally impressive 47% year-on-year growth seen in Q1 FY26.<sup>18</sup> Key export products include mobile phones, solar modules, networking devices, consumer electronics, and auto electronics. Primary export destinations span the Middle East, Africa, and Europe.<sup>19</sup>

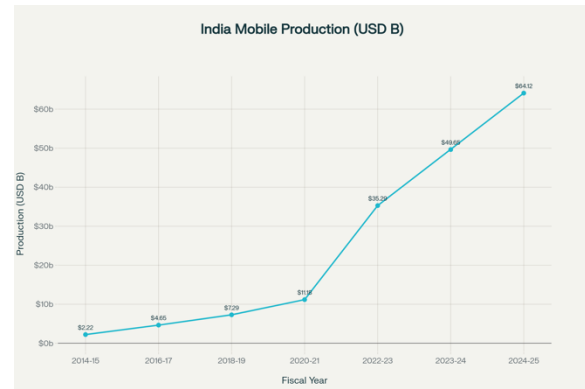
**India's electronic goods country-wise export share FY25 (April - January)**



## Cellphone Manufacturing

India's cellphone<sup>20</sup> manufacturing sector now boasts 300+ manufacturing units producing 330mn phones annually, making it the world's

second-largest manufacturer of cellphones.<sup>21</sup> Q2 FY26 saw India overtake China to become the top smartphone exporter to the United States, in part because of the shift in iPhone manufacturing supply chains.<sup>22</sup>



Mobile phone production value in India (in USD billion), 2014-2025, converted using INR 85 = USD 1.

<sup>18</sup><https://economictimes.com/news/economy/foreign-trade/indias-electronics-export-surged-47-in-q1-2025-26-piyush-goyal/articleshow/123334023.cms>;  
<https://timesofindia.indiatimes.com/business/india-business/make-in-india-milestone-electronics-exports-jump-47-in-q1-99-of-mobiles-now-made-domestically/articleshow/123335165.cms>;  
<https://ibef.org/exports/electronic-and-computer-software-industry-in-india>

<sup>19</sup> Graphic source: <https://www.ibef.org/exports/electronic-and-computer-software-industry-in-india>

<sup>20</sup> Source: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2177755>

<sup>21</sup> *Id.*

<sup>22</sup> *Id.*

## PART II

### Semiconductor Manufacturing: Policy Landscape

#### India Semiconductor Mission: Structure and Administration

The India Semiconductor Mission (ISM) was launched in December 2021 as an independent business division within the Digital India Corporation, MeitY, with an outlay of approximately INR 76,000 crore (USD 9.1bn).<sup>23</sup>

ISM functions as the nodal agency and single-window facilitator for all semiconductor incentive schemes, managing the full lifecycle from application intake and technical appraisal through to disbursement. It operates three core scheme windows: the Semiconductor Fabs Scheme, the Display Fabs Scheme, and the Compound Semiconductors/Assembly, Testing, Marking and Packaging (ATMP)/Outsourced Semiconductor Assembly and Test (OSAT) Scheme, collectively designed to address each stage of the semiconductor value chain from wafer fabrication through to assembly and testing. ISM coordinates with state governments on infrastructure support, liaises with MeitY and the Expenditure Finance Committee (EFC) for scheme appraisal, and oversees compliance and milestone-linked disbursements across all approved projects.

The scheme for semiconductor fabs extends fiscal support of up to 50% of approved project cost, where government disbursement is triggered by and proportional to actual capital expenditure incurred by the applicant.<sup>24</sup>

#### **Disbursement Mechanism**

Key scheme components are:<sup>25</sup>

- Applications are evaluated by ISM’s technical appraisal committee and forwarded to the EFC chaired by the Secretary, Department of Expenditure, which determines the final quantum and structure of fiscal support.
- Disbursements are made in tranches linked to verified construction and equipment procurement milestones, not as upfront grants. Beneficiaries must demonstrate capital deployment through third-party certifications (statutory auditors or independent engineers) before each tranche is released.

#### **Key Semiconductor Projects Approved**

Ten major projects with a committed investment of approximately USD 19bn have been approved.<sup>26</sup>

Project	Location	Type	Investment (USD billion)
Tata Electronics-PSMC	Dholera, Gujarat	Fabrication	11.0
Micron Technology	Sanand, Gujarat	ATMP	2.75
Tata TSAT OSAT	Jagiroad, Assam	OSAT	~0.5
CG Power / Renesas / Stars JV	Sanand, Gujarat	OSAT (Advanced packaging)	0.92
Kaynes Semicon OSAT	Sanand, Gujarat	OSAT	0.40
HCL-Foxconn JV	Jewar, UP	Fab/Display drivers	0.45

<sup>23</sup><https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=154968&ModuleId=3>

<sup>24</sup><https://www.pib.gov.in/PressReleasePage.aspx?PRID=1808676>

<sup>25</sup> <https://www.ism.gov.in/>

<sup>26</sup><https://carnegieendowment.org/research/2025/10/indias-semiconductor-mission-the-story-so-far>

## Scheme for Setting up Semiconductor Fabs in India

The Modified Scheme for Setting up Semiconductor Fabs in India, notified on October 4, 2022 (replacing the original scheme notified on December 21, 2021), aims to attract large investments for setting up semiconductor wafer fabrication facilities in the country to strengthen the electronics manufacturing ecosystem and establish a trusted value chain. Under the modified programme, a uniform fiscal support of 50% of project cost is provided on a *pari-passu* basis across all technology nodes. The fiscal support is available for a tenure of six years, extendable with the approval of MeitY.<sup>27</sup>

Key eligibility and incentive parameters are:<sup>28</sup>

- **Eligible Applicants:** Companies/ consortia/ joint ventures proposing to set up a semiconductor fab in India for manufacturing Logic / Memory / Digital ICs / Analog ICs / Mixed Signal ICs / SoCs, on 300 mm wafer size with an installed capacity of 40,000 Wafer Starts Per Month (WSPM) or above.
- **Investment and Revenue Thresholds:** Minimum capital investment of INR 20,000 crore (INR 200 billion); minimum revenue of INR 7,500 crore (INR 75 billion) (including Group Companies) in any of the three financial years preceding the year of application.
- **Fiscal Support:** Fifty % of Project Cost on a *pari-passu* basis. “Project Cost” includes capital expenditure on building, plant and machinery, clean rooms, equipment and associated utilities; in-house and captive R&D and IP; transfer

of technology; land; interest accumulated during construction; and insurance costs.

- **Government Equity Cap:** Where fiscal support is provided as equity (in part or in full), the Government of India’s share would not exceed 49% of total project equity.

Applicants are evaluated by ISM through Quality and Cost Based Selection (QCBS), a procurement methodology under which applicants are scored on a weighted combination of technical quality (encompassing process technologies, implementation capacity, and operation capability) and financial parameters (structure of fiscal support sought). Selected applicants are forwarded to MeitY and ultimately placed before the Union Cabinet for approval after financial appraisal by the EFC. Disbursements are made on a *pari-passu* basis by the Nodal Agency (i.e. ISM), with budgetary provisions made by MeitY. Additional support includes benefits of EMC 2.0 for infrastructure, purchase preference under the Public Procurement (Preference to Make in India) Order 2017, and an earmarking of up to 2.5% of the scheme outlay for R&D, skill development and training.<sup>29</sup>

## Scheme for Setting up of Display Fabs in India

The Modified Scheme for Setting up of Display Fabs in India, notified on October 4, 2022 (replacing the original scheme notified on December 21, 2021), is aimed at attracting large investments for manufacturing TFT LCD or AMOLED based display panels in India to strengthen the electronics manufacturing ecosystem. The scheme extends fiscal support of up to 50% of Project Cost on a *pari-passu* basis to approved applicants. Fiscal support is provided

<sup>27</sup>[https://d2p5j06zete1i7.cloudfront.net/Cms/2022/Oct/07/1665119978\\_Notification\\_Modified\\_Scheme\\_for\\_Semiconductor\\_Fabs.pdf](https://d2p5j06zete1i7.cloudfront.net/Cms/2022/Oct/07/1665119978_Notification_Modified_Scheme_for_Semiconductor_Fabs.pdf)

<sup>29</sup> *Id.*

for 6 years, extendable with the approval of the MeitY.<sup>30</sup>

Key eligibility and incentive parameters are:<sup>31</sup>

- **Eligible Applicants:** Companies / consortia / joint ventures proposing to set up a Display Fabrication Unit (Fab) in India for manufacturing TFT LCD or AMOLED based display panels.
- **Fiscal Support:** 50% of Project Cost on a *pari-passu* basis. “Project Cost” includes capital expenditure on building, plant, machinery, clean rooms, equipment and associated utilities (including used/second-hand/refurbished); R&D; transfer of technology; and land.
- **Government Equity Cap:** Where fiscal support is provided as equity (in part or in full), the Government of India’s share shall not exceed 49% of total project equity for selected applicants.

The Nodal Agency evaluates applicants through a process of technological and financial appraisal and subsequently negotiates with selected applicants to propose the appropriate process technology, applications, generation, capacity, and structure and quantum of fiscal support. After evaluation and negotiation, the scheme is appraised by the EFC, which determines the final structure and quantum of fiscal support. Selected applicants are then placed before the Union Cabinet for final approval. Claims for fiscal support may be submitted on a quarterly basis, and disbursement is carried out by the Nodal Agency on a *pari-passu* basis after verification, including the right to carry out physical inspection of manufacturing units. Additional

support includes benefits under EMC 2.0, purchase preference under the Public Procurement (Preference to Make in India) Order 2017, and a roadmap for R&D, skill development and training prepared in consultation with approved applicants.<sup>32</sup>

### **Scheme for Setting up of Compound Semiconductors / Silicon Photonics / Sensors Fab / Discrete Semiconductors Fab and Semiconductor ATMP / OSAT Facilities in India**

The Modified Scheme for Setting up of Compound Semiconductors / Silicon Photonics / Sensors (including MEMS) Fabs / Discrete Semiconductors Fab and Semiconductor ATMP / OSAT Facilities in India, notified on October 4, 2022 (replacing the original scheme notified on December 21, 2021), aims to attract investments for establishing compound semiconductor fabs and semiconductor packaging facilities. The original scheme extended fiscal support of 30% of capital expenditure; the modified programme enhanced this to 50% of capital expenditure on a *pari-passu* basis and expanded its scope to include discrete semiconductor fabs.<sup>33</sup>

Key eligibility and incentive parameters are:<sup>34</sup>

- **Eligible Applicants:** Companies / joint ventures proposing to set up Compound Semiconductors (GaN, SiC, GaAs, etc.) / Silicon Photonics (SiPh) / Sensors (including MEMS) Fabs; and/or Semiconductor ATMP / OSAT facilities in India.
- **Investment Thresholds:** Minimum capital investment of INR 100 crore for Compound Semiconductor Fabs and INR 50 crore for ATMP / OSAT facilities.

<sup>30</sup> [https://d2p5j06zete1i7.cloudfront.net/Cms/2022/Oct/07/1665120088\\_Notification\\_Modified\\_Scheme\\_for\\_Display\\_Fabs.pdf](https://d2p5j06zete1i7.cloudfront.net/Cms/2022/Oct/07/1665120088_Notification_Modified_Scheme_for_Display_Fabs.pdf)

<sup>31</sup> *Id.*

<sup>32</sup> *Id.*

<sup>33</sup> [https://d2p5j06zete1i7.cloudfront.net/Cms/2022/Oct/07/1665120229\\_Notification\\_Modified\\_Scheme\\_for\\_Compound\\_Semiconductor\\_ATMP.pdf](https://d2p5j06zete1i7.cloudfront.net/Cms/2022/Oct/07/1665120229_Notification_Modified_Scheme_for_Compound_Semiconductor_ATMP.pdf)

<sup>34</sup> *Id.*

Where an application covers both Fab and ATMP, the higher individual threshold applies.

- **Fiscal Support:** 50% of Capital Expenditure on a *pari-passu* basis. “Capital Expenditure” includes expenditure on building, clean rooms, plant, machinery, equipment and associated utilities (including used/second-hand/refurbished); R&D; and transfer of technology. Notably, expenditure on land is *not* included in eligible capital expenditure under this scheme.
- **Applicability:** The scheme applies to investments in new units as well as expansion of capacity / modernisation, and/or diversification of existing units.

The Competent Authority for approving fiscal support up to INR 100 crore is the Secretary, MeitY. For amounts above INR 100 crore, the matter is appraised by the EFC and placed before the Union Cabinet for final approval, which is a higher-order approval process that involves cross-ministerial review. Approved units are required to remain in commercial production for at least three years from the date of commencement of commercial production or one year from the date of receipt of the last fiscal support, whichever is later; default or closure before this period requires refund of the fiscal support disbursed. The fiscal support tenure is five to six years from the date of acknowledgement. Additional support includes benefits under EMC 2.0, purchase preference under the Public Procurement (Preference to Make in India) Order 2017, and a roadmap for R&D, skill development and training to be

prepared in consultation with approved applicants.<sup>35</sup>

### Design Linked Incentive (DLI) Scheme

The Design Linked Incentive (DLI) Scheme aims to offer financial incentives as well as design infrastructure support across various stages of development and deployment of semiconductor designs for Integrated Circuits (ICs), Chipsets, Systems on Chips (SoCs), Systems & IP Cores and semiconductor linked designs over a period of 5 years. The DLI scheme comprises three components,<sup>36</sup> with the following benefits:<sup>37</sup>

- **Product Design Linked Incentive:** Reimbursement of up to 50 % of eligible design, prototyping, and IP licensing expenditure, capped at INR 15 crore per application.
- **Deployment Linked Incentive:** 4–6 % of net sales turnover over five years for approved semiconductor designs deployed in electronic products, capped at INR 30 crore per application.
- **Access to IP Libraries:** Access to high-end electronics design automation tools and verified IP libraries.

Disbursements are made on a quarterly or annual basis (depending on the project) after verification of claims submitted by the applicant. As of July 2025, the scheme had approved 25 chip design products, with 278 academic institutions and 72 startups and MSMEs receiving access to tools and IP libraries.<sup>38</sup>

### ISM 2.0: The Next Step Towards Self Reliance

With the objective of accelerating the growth of the sector, ISM 2.0 was announced in the Union Budget 2026–27. ISM 2.0 represents a policy

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<sup>35</sup> *Id.*

<sup>36</sup> <https://pib.gov.in/PressReleasePage.aspx?PRID=1790346>

<sup>37</sup> <https://chips-dli.gov.in/DLI/HomePage>

<sup>38</sup> <https://www.china-briefing.com/china-outbound-news/india-backs-23-semiconductor-chip-design-projects>

push to deepen domestic semiconductor capabilities.

ISM 2.0 is expected to focus on producing semiconductor equipment and materials in India, designing full stack Indian semiconductor intellectual property, and fortifying both domestic and global supply chains. An allocation of INR 1,000 crore has been made for ISM 2.0 for FY 2026–27, with a strong emphasis on industry-led research and training centres to drive technology development and create a future-ready skilled workforce.<sup>39</sup> The scheme’s administrative framework is currently under finalisation, with applications expected in Q1–Q2 FY27. Priority areas include compound semiconductors (SiC, GaN), advanced packaging, full-stack design IP, and industry-led training centers.<sup>40</sup>

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<sup>39</sup><https://static.pib.gov.in/WriteReadData/specificdocs/documents/2026/feb/doc202627782201.pdf>

<sup>40</sup><https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=157237&ModuleId=3&reg=3&lang=2>

## PART III

### Recommended Reforms and Way Forward

India aspires to develop advanced capabilities and achieve full supply chain integration in semiconductor and electronics manufacturing. If achieved, this would establish India as a serious alternative hub in global diversification strategies, particularly as firms seek to de-risk from overconcentration in geographies like Taiwan and China. The following key action points consolidate suggested reforms across both sectors. Legal and regulatory reforms are addressed first, followed by operational and strategic recommendations.

#### Legal and Regulatory Reforms

- **Infrastructure status for the ESDM sector:** Include the ESDM sector in the Harmonised Master List of Infrastructure Sub-sectors to unlock access to dedicated infrastructure status benefits, concessional financing, and faster project approvals, thereby bolstering long-term sector growth.
- **Semiconductor cluster utility infrastructure:** The Government may consider designating the critical utility infrastructure serving semiconductor clusters, including dedicated power substations with voltage stabilisation equipment, ultra-pure water treatment and supply networks, industrial gas distribution systems, and specialised effluent treatment facilities as ‘infrastructure’ under the Harmonised Master List. This would enable foreign investments under the Foreign Venture Capital Investment route, thereby easing pricing requirements and form-of-instrument restrictions for potential foreign investors.
- **Comprehensive ease of doing business reforms:** Review ease of doing business under the overall legal framework, including environmental laws, applicable industrial standards, as well as state-specific laws, and rationalise licensing and registration processes to give a thrust to expansion. Introduce a holistic forward pathway that encompasses digital single-window portals for all ESDM approvals, harmonised state-level incentives to eliminate jurisdictional disparities, simplified land acquisition norms tailored for high-tech parks, and proactive policy sandboxes to test innovative manufacturing practices. These initiatives will facilitate the creation of a seamless, investor-friendly ecosystem that accelerates capacity build-up and operational agility across the sector.
- **Targeted incentives for semiconductor startups:** Easing compliance requirements for a defined period until a business achieves scale and providing additional tax and other benefits to startups in the semiconductor space would encourage both domestic and foreign investment by providing targeted incentives to investors.
- **Unified incentive framework:** Consider consolidating M-SIPS, PLI, and ECMS into a unified framework harmonising eligibility, stacking rules, and compliance obligations. This would enable companies to avail benefits with greater ease.
- **Easing FDI restrictions on sales channels:** Ease restrictions with respect to retail sale, whether online or offline, on companies in the sector that have FDI. This will create an ecosystem of greater consumer engagement, deeper penetration into second-tier and semi-rural markets, and promote technology access across socio-economic sectors.

## Operational and Strategic Reforms

- ***Back-end infrastructure for semiconductor fabs:*** Semiconductor fabs require 24/7 operation with near-perfect power quality. Voltage sags can severely impact operations, requiring weeks to recalibrate.<sup>41</sup> Water availability poses parallel challenges: semiconductor fabrication is extraordinarily water-intensive, with a single advanced fab consuming tens of millions of litres of ultra-pure water per day for wafer cleaning, chemical-mechanical planarisation, and cooling operations. Proposed semiconductor clusters such as Dholera (Gujarat) are located in semi-arid regions where water infrastructure relies on distant sourcing or incomplete desalination projects.<sup>42</sup> The Government should prioritise dedicated power reliability and water supply solutions as foundational enablers for semiconductor cluster development.
- ***Semiconductor equipment and materials ecosystem:*** To strengthen the semiconductor sector ecosystem, the Government can provide equipment and materials support by encouraging MSMEs and domestic suppliers through fiscal incentives, policy measures, and R&D infrastructure aimed at promoting the indigenous manufacturing of raw materials and components in India. ISM 2.0 has made some important commitments in this regard and specific policy remains to be seen.
- ***Supply chain localisation:*** Over-reliance on Chinese supply chains for raw materials and intermediate goods means that the goal of self-reliant and integrated supply chains remains elusive. Incentive structures need to be revisited to drive priority towards domestic supply chain.

Having said the above, success will depend on several critical factors: Sustained R&D investment; development of indigenous IP portfolios, seamless integration of design-to-manufacturing ecosystems, policy stability and consistent implementation, strategic international partnerships maintaining technology access, and cultivation of innovation culture supporting startups and entrepreneurs will all go a long way in fulfilling India's aspirations to be a dominant global player in the ESDM sector.

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<sup>41</sup> <https://voltage-disturbance.com/voltage-quality/semi-f47-voltage-sag-immunity-standard/>

<sup>42</sup> <https://mirrikh.com/semiconductor-hub-in-gujarat-dholeras-smart-future/>