SEMICONDUCTOR INDUSTRY - GS III MAINS

Q. Developing a domestic semiconductor manufacturing ecosystem will give a flip to India's dream of emerging as a manufacturing hub in the world. Discuss the measures taken by India to achieve the dream. (15 marks, 250 words)

News: *The need to overhaul a semiconductor scheme*

What's in the news?

- The mid-term appraisal of the semiconductor **Design-Linked Incentive (DLI) scheme is** due soon. Since its announcement, the DLI scheme has approved only seven start-ups, markedly short of its target of supporting 100 over five years.
- This impact assessment, therefore, presents an opportunity for policymakers to appraise and revamp the scheme.

Key takeaways:

- An overhauled Semiconductor Design-Linked Incentive scheme would fortify India's comparative advantage and augment its forays into other stages of the semiconductor global value chain.

Goals of India's Semiconductor Industry:

1. To **reduce dependence on semiconductor imports,** particularly from China, and especially in strategic and emerging sectors, ranging from defence applications to Artificial Intelligence development.
2. To **build supply chain resilience** by integrating into the semiconductor global value chain (GVC).
3. To **double down on India's comparative advantage** - India already plays host to the design houses of every major global semiconductor industry player and Indian chip design engineers are an indispensable part of the semiconductor GVC.

Reasons for the need of India's semiconductor independence:

1. **Fourth Industrial Revolution:**
   - Semiconductor integrated circuits that are fit to be a part of practically all electronic hardware in the world and it is going to act as a core component in the fourth Industrial revolution.
   - Independence in the semiconductor manufacturing ecosystem is **necessary for India to actively participate in Industry 4.0.**
2. **China's dominance**:
   - China is dominating the semiconductor fabs in the world and it acts as a core in the semiconductor supply chain.

- **It accounts for around 40% of the total semiconductor manufacturing in the world.**
- Reducing the dependence of China is a major priority for India to establish its own semiconductor manufacturing industries.

3. **Employment creation**:
   - India is an important destination for global semiconductor companies primarily because of its highly-skilled talent pool of semiconductor design engineers.
   - The creation of forward and backward linkages in the semiconductor manufacturing system will give more employment opportunities.
4. **Own supply chain in semiconductor:**
   - The pandemic has brought to the fore the fragility of the global supply chain of semiconductor manufacturing.
   - Building your own semiconductor manufacturing system is useful in the times of major global semiconductor supply chain issues.
5. **Development of ancillary industries:**
   - Developing domestic semiconductor manufacturing ecosystem will give a fillip to the Indian gas, materials and mines industry and also expand opportunities for semiconductor equipment, spares and service industry.
6. **Global market:**
   - The development of the semiconductor industries domestically will be a great thing to access **the future global market as the market volume will be US$818.60bn by 2027.**

Issues in the Semiconductor industry:

1. **High input cost**:
   - Any policy directed towards the semiconductor industry, be it manufacturing or design, requires a long-term strategy.
   - Because the sector is **capital-intensive** and involves **sizable costs in setting up fabrication units,** upscaling manufacturing capabilities and equipment.
2. **Poor investor confidence:**
   - Supply chain disruptions, like what happened during the COVID-related lockdowns in China, could dampen potential investor confidence in the sector.
3. **Higher gestation period:**
   - Returns from the investment are not immediate as setting up design and fabrication units involves long gestation periods.
4. **Issues in the raw material**:
   - Rare earth metals are required to produce semiconductors as India has poor rare earth metals reserves and it depends on China for almost 90% of its raw material supply.

Government measures in this regard:

1. **SemiconIndia future DESIGN initiative**:
   - It was started with an aim to encourage startups, next-generation innovators and business leaders to invest in the semiconductor sector in India.

- **Over 30 semiconductor design startups have been established** in India following the initiative with five already having received government support.

2. **Design Linked Incentive scheme:**
   - The Design Linked Incentive (DLI) Scheme shall extend product design linked **incentive of up to 50% of eligible expenditure and product deployment linked incentive of 6% - 4% on net sales for five years.**
   - Support will be provided to 100 domestic companies of semiconductor design for Integrated Circuits (ICs), Chipsets, System on Chips (SoCs).
3. **Equity stake by the government:**
   - As part of the second phase of the design-linked incentive (DLI) scheme for the domestic semiconductor industry, the **Indian government** is considering a proposal to **pick an equity stake in domestic chip design-making companies.**
4. **Production Linked Incentive Scheme:**
   - Incentive support to the tune of Rs.55,392 crore have been provided under Production Linked Incentive (PLI) for Largest Scale Electronics Manufacturing, PLI for IT Hardware.
5. **India Semiconductor Mission:**
   - Semiconductor Mission was launched by India in December 2021, with an incentive outlet of Rs 76,000 crore.
   - The mission has been set up as a dedicated institution for the Semicon India Programme.
   - The primary aim of this mission is to **attract investment** in the strategic Semiconductor sector and to **facilitate in building digital infrastructure.**
6. **Modified Special incentive Package scheme:**
   - It was launched in **2012** to attract investments and boost production in the electronics goods industry.
   - The purpose of the initiative was not only to encourage investments but also to generate employment opportunities.
7. **SPECS Scheme:**
   - This scheme provides financial **incentive of 25% on capital expenditure for the identified list of electronic goods** that comprise downstream value chain of electronic products, i.e., electronic components, semiconductor/display fabrication units, ATMP units.
8. **ChipIN Centre:**
   - MeitY has set up ChipIN Centre at C-DAC Bangalore to dedicate its services to the semiconductor design community of the country.
   - The facility acts as a one-stop center to provide semiconductor design tools, fab access, virtual prototyping hardware lab access to fabless chip designers from Startups and Academia.

WAY FORWARD:

1. **Formation of a high powered committee:**
   - The government should put in place an investment committee and a framework for target evaluation and governance to mitigate the moral hazard posed by politically driven equity investments.
2. **Supporting Premier Research Institutions for Chip industry:**

- Premier research institutions such as the Indian Institute of Science should also be asked to work aggressively on R&D in chip designing and manufacturing.

3. **Fostering Indian Manufacturers & Start-ups in R&D:**
   - Encouraging Indian manufacturers and start-ups to enter and master complex Research and Development verticals.
4. **Incentivise the Indian-Origin Design Start-ups:**
   - Government must encourage the highly skilled Indian origin to set up their design start-ups with handsome government grants and tax incentives.
5. **China's Fab Acquisition Model for Chip Industry:**
   - China model Initiative of acquiring existing fabs has many advantages such as
     - They are reasonably priced, have stabilized technology, a supply chain ecosystem, an established product line, and market.