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# India Semiconductor Mission 2.0 and Quantum Valley Amaravati — Building the Strategic Technology Stack

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# India Semiconductor Mission 2.0 and Quantum Valley Amaravati — Building the Strategic Technology Stack

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## WHY IN NEWS

Union Budget 2026-27 allocated Rs 1,000 crore to India Semiconductor Mission 2.0 (ISM 2.0) while the foundation stone of India's first Quantum Valley was laid in Amaravati, Andhra Pradesh — both signalling India's push to become a strategic technology manufacturer rather than merely a technology consumer.

## INDIA SEMICONDUCTOR MISSION — FROM ISM 1.0 TO ISM 2.0

### ISM 1.0 — Building the Foundation (2021–2025)

**India Semiconductor Mission (ISM)** was launched in **December 2021** under the **India Semiconductor Mission** — a specialised body within MeitY (Ministry of Electronics and Information Technology). The scheme carried a **Rs 76,000 crore incentive outlay** providing **up to 50% fiscal support** for semiconductor fabrication units, display fabs, and compound semiconductors.

#### ISM 1.0 achievements:

**10 projects** approved worth **Rs 1.60 lakh crore** across 6 states

Key approved units:

**Tata Electronics** — semiconductor fab in **Dholera Special Investment Region, Gujarat** (N28 node; 50,000 wafers/month capacity)

**CG Power** (Renesas/STARS Microelectronics JV) — ATMP (Assembly, Testing, Marking, Packaging) unit in Sanand, Gujarat

**Micron Technology** — ATMP unit in Sanand, Gujarat — India's first semiconductor facility under ISM

**Kaynes Semicon** — ATMP unit in Sanand, Gujarat

**Zetwerk Electronics** facility (Rs 100 crore) inaugurated in Bengaluru by MeitY Minister Ashwini Vaishnav — equipped with **SMT (Surface Mount Technology)** and **FATP (Final Assembly, Testing and Packing)** lines

India's semiconductor market grew from **\$38 billion (2023)** to **\$45–50 billion (2024-25)** and is projected to reach **USD 100–110 billion by 2030**.

## ISM 2.0 – The Next Phase (2026 Budget)

Budget 2026-27 allocated **Rs 1,000 crore** for ISM 2.0. Additional allocation: **Modified Programme for Display Manufacturing** received **Rs 8,000 crore** for 2026-27.

### ISM 2.0 targets:

**70–75% semiconductor self-sufficiency by 2029**

Capability for **3nm/2nm chip fabrication by 2035** (currently, India's approved fabs target 28nm–65nm nodes — sufficient for automotive, IoT, defence applications)

Expanded ATMP and design ecosystem to support the broader chip supply chain

## Why Semiconductors Are a Strategic Priority

Semiconductors are the **oil of the 21st century** — every electronic device, defence system, telecommunications network, and AI system depends on chips. India currently imports **95%+ of its semiconductor requirements**.

The vulnerability was exposed during the **2020–2022 global chip shortage** — caused by COVID-19 supply chain disruptions — which halted automobile production, delayed smartphone launches, and revealed how dependent India's entire manufacturing sector is on a handful of global foundries (primarily TSMC in Taiwan and Samsung in South Korea).

**Geopolitical risk:** Taiwan produces ~92% of the world's most advanced chips. Any conflict in the Taiwan Strait would be catastrophic for India's technology supply chains. **Atma Nirbharta in semiconductors** is therefore a national security imperative, not merely an industrial policy.

## INDIA'S FIRST QUANTUM VALLEY — AMARAVATI

### What Was Inaugurated

The foundation stone of India's first **Quantum Valley** was laid at **Uddandarayunipalem village, Thullur mandal, Amaravati, Andhra Pradesh** by Union Minister Dr. Jitendra Singh (Minister of State, PMO/Science & Technology) and AP CM N. Chandrababu Naidu.

### Key infrastructure:

**133-qubit quantum computer centre** — among the largest planned quantum computing facilities in Asia outside China and Japan

Partners: **IBM** (quantum hardware), **TCS** (software/integration), **L&T** (construction/infrastructure), **C-DOT** (communications), **C-DAC** (HPC/quantum research), **SRM University** (academic partnership)

Completion timeline: **August 2026** (main complex), **December 2026** (quantum computer operational)

## Quantum Computing – The Technology Context

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Classical computers use bits (0 or 1). **Quantum computers use qubits** – which, through quantum superposition, can represent 0 and 1 simultaneously. This enables exponentially greater computational power for specific problem classes:

**Cryptography:** Breaking or creating encryption systems

**Drug discovery:** Simulating molecular interactions for pharmaceutical research

**Financial modelling:** Portfolio optimisation and risk analysis

**Logistics:** Route optimisation (travelling salesman class problems)

**AI/ML training:** Accelerating neural network optimisation

The **133-qubit** system positions India to work on real-world quantum advantage problems – the threshold where quantum computers definitively outperform classical ones for certain applications is estimated at around 100–1000 qubits depending on the application.

India's National Quantum Mission (**NQM**), launched in **April 2023** with a **Rs 6,003.65 crore outlay** (2023-31), provides the policy framework within which the Amaravati Quantum Valley operates. NQM targets:

50–1,000 physical qubit systems within 8 years

Quantum communication over 2,000 km

Satellite-based quantum key distribution (QKD)

## WISER Quantum Talent Hub

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**WISER Quantum Talent Hub** aims to train **35 lakh students** by 2035 – addressing the severe global talent shortage in quantum computing, where demand currently far exceeds supply of qualified researchers and engineers.

## India's Position in the Global Quantum Race

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**USA:** IBM, Google, Microsoft leading; IBM achieved 1,121-qubit system in 2023

**China:** Aggressively investing; Origin Quantum produced 72-qubit Wuyuan processor

**EU:** €1 billion Quantum Flagship programme

**India:** 133-qubit Amaravati centre + NQM positions India as a credible mid-tier quantum power

## THE SEMICONDUCTOR-QUANTUM NEXUS

Both ISM 2.0 and Quantum Valley Amaravati represent India's recognition that the **commanding heights of the 21st-century economy** are in technology manufacturing, not just technology services. India has built a world-class IT services industry (USD 200+ billion in FY25 exports) but remains dependent on foreign hardware.

The strategy is three-layered:

**Near-term (by 2029):** ATMP facilities and 28nm fabs reduce chip import dependency for defence, automotive, and IoT sectors

**Medium-term (by 2035):** Advanced fabs (3nm/2nm) and quantum computing infrastructure establish India in the global technology supply chain

**Long-term:** India as a technology exporter — not just of software but of hardware, chips, and quantum systems

## UPSC RELEVANCE

*ISM 1.0 launch year (2021), Rs 76,000 crore outlay, ISM 2.0 Rs 1,000 crore (Budget 2026-27), 10 projects Rs 1.60 lakh crore, Tata Electronics (Dholera), Micron (Sanand), ISM target 70-75% self-sufficiency by 2029, 3nm/2nm by 2035, Quantum Valley (Amaravati/Thullur), 133-qubit, NQM (Rs 6,003.65 crore, April 2023), WISER 35 lakh students, MeitY, C-DAC, C-DOT.*

*Semiconductor strategy; quantum computing policy; Make in India in strategic industries; technology supply chain security; NQM objectives; India-Taiwan chip dependency risk.*

**★ FACTS CORNER — KNOWLEDGEPEDIA**
**INDIA SEMICONDUCTOR MISSION:**

ISM 1.0 launched: **December 2021**; outlay: **Rs 76,000 crore** (50% fiscal support)  
 Approved projects: **10** worth **Rs 1.60 lakh crore** across 6 states  
 Key units: Tata Electronics (Dholera, Gujarat); Micron/CG Power/Kaynes (Sanand, Gujarat)  
 ISM 2.0 Budget 2026-27: **Rs 1,000 crore**; Display Manufacturing: **Rs 8,000 crore**  
 India semiconductor market: **\$45–50B (2024-25)** → projected **\$100–110B by 2030**  
 Self-sufficiency target: **70–75% by 2029**; advanced fab (3nm/2nm): **by 2035**  
 India currently imports: **95%+** of semiconductor requirements

**QUANTUM VALLEY — AMARAVATI:**

Location: **Uddandarayunipalem, Thullur, Amaravati, Andhra Pradesh**  
 Quantum computer: **133 qubits** (operational: Dec 2026)  
 Partners: **IBM, TCS, L&T, C-DOT, C-DAC, SRM University**  
 WISER Talent Hub: **35 lakh students** by 2035

**NATIONAL QUANTUM MISSION (NQM):**

Launched: **April 2023**; Outlay: **Rs 6,003.65 crore** (2023-2031)  
 Target: **50–1,000 qubit systems** within 8 years; Quantum communication: **2,000 km**  
 Satellite-based QKD (Quantum Key Distribution) included

**SEMICONDUCTOR TECHNOLOGY NODES:**

ISM 1.0 fabs: **28nm–65nm** (automotive, IoT, defence grade)  
 Global leaders: TSMC (Taiwan) ~**92%** of most advanced chips; Samsung (South Korea)  
 Global chip shortage (2020-22): COVID-triggered; revealed India's 95%+ import dependency

**C-DAC = CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING; C-DOT = CENTRE FOR DEVELOPMENT OF TELEMATICS SMT = SURFACE MOUNT TECHNOLOGY; FATP = FINAL ASSEMBLY, TESTING AND PACKING ATMP = ASSEMBLY, TESTING, MARKING, AND PACKAGING (SEMICONDUCTOR BACK-END PROCESS)**

Sources: Drishti IAS, AffairsCloud

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