

Emerging Science, Technology, and Innovation Conclave

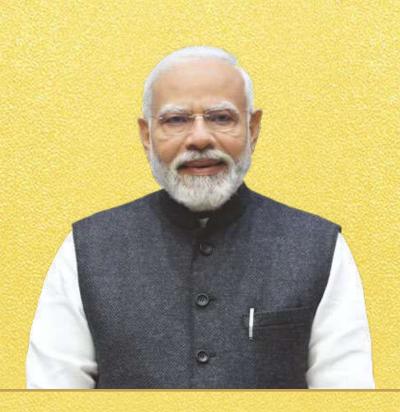
ESTIC 2025

Imagine. Innovate. Inspire. for Viksit Bharat 2047









Our Government is continuously working to encourage research and innovation among the youth. This is important to realise our dream of a Viksit Bharat

Shri Narendra Modi

Hon'ble Prime Minister



डॉ. जितेन्द्र सिंह

राज्य गंत्री (स्वतंत्र प्रभार). विज्ञान और प्रीधोगिकी मंत्रालय पृथ्वी विज्ञान मंत्रालय, राज्य मंत्री प्रधान मंत्री कार्यालय. कार्मिक, लोक शिकायत तथा पेशन मंत्रालय, परमाण उर्जा विभाग तथा अंतरिक्ष विभाग, भारत सरकार



DR. JITENDRA SINGH

Minister of State (Independent Charge). Ministry of Science & Technology, Ministry of Earth Sciences, Minister of State, Prime Minister's Office, Ministry of Personnel, Public Grievances and Pensions. Department of Atomic Energy & Department of Space, Government of India



Message

India today stands at a defining moment in its scientific journey.

Over the past eleven years, the nation has witnessed an extraordinary transformation across the spectrum of science, technology, and innovation. From pioneering advances in space and nuclear technologies to global leadership in digital public infrastructure, renewable energy, deep-tech startups, and biotechnology, India's S&T ecosystem has emerged as a key pillar of national progress and global collaboration.

The vision of Viksit Bharat@2047 a developed, self-reliant, and technology-driven India is deeply rooted in scientific excellence, innovation, and entrepreneurship.

The last decade has shown how science can drive socio-economic change, empower citizens, and create sustainable livelihoods. Whether through affordable healthcare innovations, precision agriculture, clean energy transitions, or advances in frontier areas such as quantum technologies, artificial intelligence, and materials science, India's scientific community continues to shape a resilient and inclusive future.

As we look ahead, initiatives such as the Emerging Science, Technology and Innovation Conclave (ESTIC) 2025 reflect India's national aspiration to accelerate discovery, innovation, and collaboration across the scientific spectrum, nurture collaboration among researchers, industries, StartUps and policymakers, Bringing together researchers, industries, startups, and policymakers, ESTIC 2025 will serve as a catalyst for breakthrough ideas, global partnerships, and next-generation technologies. It will chart the innovation pathways that will power India's progress toward Viksit Bharat and strengthen our leadership in the global S&T ecosystem.

India's journey in science and technology is not merely a record of achievements, it is a reflection of our collective vision, resilience, and determination to shape a better future. The years ahead will be pivotal in transforming this momentum into path-breaking innovations that address the world's pressing challenges from climate change and energy security to sustainable food systems and equitable access to technology.

The strides of the past eleven years strengthen our confidence for the future. Indian science will continue to guide our journey toward Viksit Bharat@2047, inspiring every generation to dream, innovate, and transform the nation

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Foreword

India's scientific and technological landscape is entering a defining era-one that demands not only breakthrough innovations but also systemic integration, anticipatory governance, and a shared sense of national purpose.

The Emerging Science, Technology and Innovation Conclave (ESTIC) is a pioneering initiative designed to meet the demands of this critical juncture. It provides a unified. forward-looking platform to steer India's science and technology landscape over the next two decades, in alignment with the transformative goals of Viksit Bharat@2047.

This Vision Document is the outcome of a collaborative effort involving 13 ministries and departments, each bringing its domain expertise and strategic mandate to the table. It reflects a collective commitment to harness science and technology as instruments of inclusive development, global competitiveness, and societal resilience. It is not a static plan but a dynamic instrument—designed to evolve with emerging challenges, opportunities, disruptive technologies, and shifting geopolitical realities.

At its core are eleven frontier themes: Advanced Materials & Manufacturing, Quantum Science & Technology, Energy Environment & Climate, Artificial Intelligence, Electronics and Semiconductor Manufacturing, Bio-Manufacturing, Blue Economy, Space Technologies, Digital Communications, Emerging Agriculture Technologies, and Health and Medical Technologies. Each theme is explored through a multidimensional lens—examining global trends, India's current positioning, and the strategic imperatives required to lead in a rapidly evolving world.

The document places strong emphasis on strategic clarity as a foundational principle for long-term national planning. It articulates thematic missions, outlines India's global aspirations, and presents actionable roadmaps. At the same time, the document remains grounded in indigenous strengths; our rich scientific heritage, institutional depth, demographic dividend, and growing innovation capacity. This dual lens-global relevance and local resilience-ensures that India's S&T roadmap is not only visionary but also implementable.

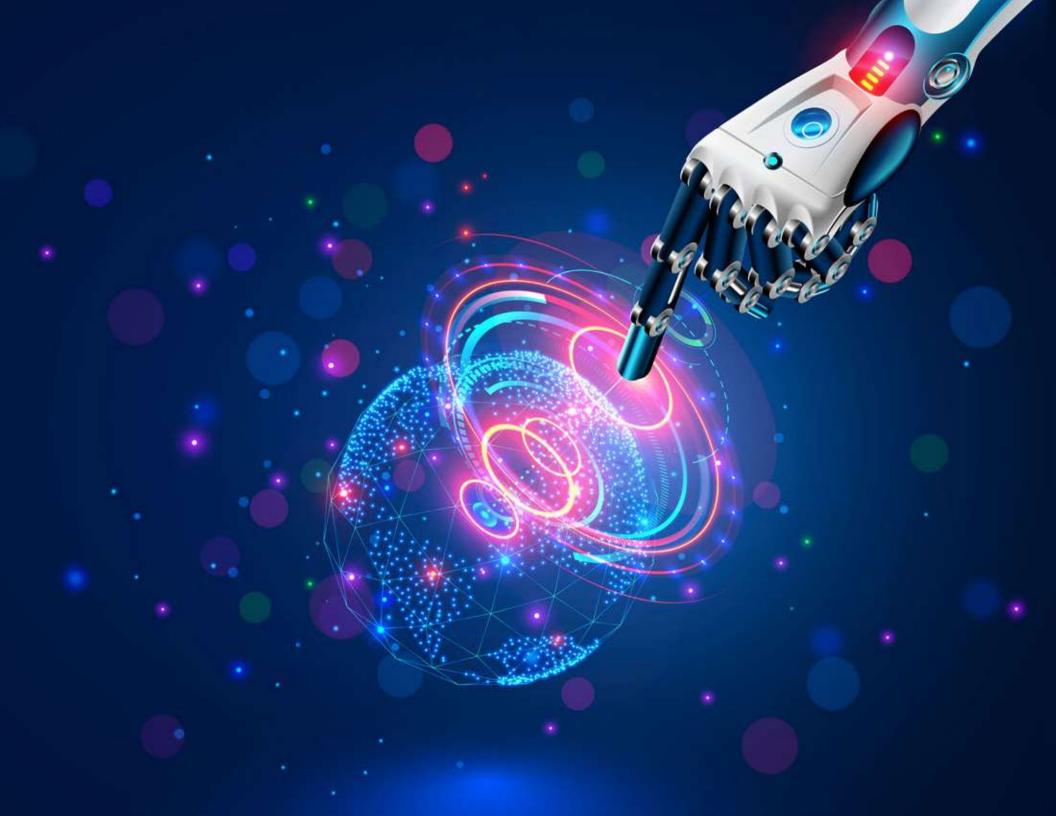
By embedding clarity of purpose into each thematic area, the Vision Document empowers ministries, institutions, and innovators to align their efforts, measure progress, and adapt dynamically-ensuring that India's scientific advancement is not only accelerated, but also deeply anchored in national interest.

Above all, this Vision Document is a call to a collective leadership. As India charts its course toward Viksit Bharat@2047, it serves as both a compass and a catalyst, providing direction and momentum to galvanize a whole-of-government and whole-ofsociety approach to science and technology.

The path ahead will require agility in decision-making, deep collaboration across sectors, and sustained investment in knowledge, talent, and infrastructure.

This document invites scientists, policymakers, industry leaders, academic institutions, and young innovators to co-create a future where technology is not only a driver of economic growth, but a force for equity, sustainability, and national pride.

Date: 31st October 2025



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Emerging Science, Technology & Innovation Conclave (ESTIC) – 2025 Vision

The Emerging Science, Technology & Innovation Conclave (ESTIC), steered by the Department of Science and Technology (DST) in association with 12 other Ministries and Departments, under the guidance of the Office of Principal Scientific Adviser to the Government of India is a national initiative providing a platform for global visionaries, policymakers, scientists, industry leaders, and entrepreneurs to discuss the directions of future science and technology and innovation-driven solutions for industry and society.

Adopting a whole-of-government approach, ESTIC revolves around four key pillars. These include advancing emerging S&T, engaging future leaders in S&T, fostering collaborations, and celebrating the contributions of stakeholders in science. These reflect a shared national vision of accelerating discovery, innovation-led growth through synergy between government, academia, industry, and start-ups.

ESTIC focuses on eleven thematic areas vital for India's transformation into a global technology leader. These include Advanced Materials & Manufacturing; Artificial Intelligence; Bio-Manufacturing; Blue Economy; Digital Communications; Electronics & Semiconductor Manufacturing; Emerging Agricultural Technologies; Energy; Environment & Climate; Health & Medical Technologies; Quantum & Space Technologies.

The Vision Document targets to align scientific progress with goals of the National towards sustainability, resilience, and inclusive growth. It can help strengthen coordination across ministries and provide a mission-oriented framework to convert scientific excellence into measurable outcomes that benefit humanity as a whole and the country in particular.

The document could help enable evidence-based policymaking, investment prioritization, and innovation planning. It aims to transform India's scientific potential into tangible results, contributing to Viksit Bharat 2047: an innovation-driven developed nation.

ESTIC calls for sustained collaboration among ministries, research institutions, industry, and start-ups to translate ideas into real-world applications. Strengthening global partnerships, encouraging private investment, and maintaining timely reviews will ensure India's S&T ecosystem remains dynamic, competitive, and socially responsive, propelling the nation towards becoming a leader in science, technology and innovation.



Advanced Materials & Manufacturing Council of Scientific & Industrial Research (CSIR)



India's Quest for Advanced Materials & Manufacturing

Across the world, materials define progress—shaping technologies, industries, and the future.

For India, advancing in Advanced Materials & Manufacturing (AM&M) is a national imperative to secure sovereignty, capture global markets, and meet priorities in defence, energy, healthcare, and beyond.

The vision: to design, develop, and produce advanced materials through innovation, collaboration, and a skilled national talent pool—the backbone of India's technological future.

The scope covers a discovery-to-deployment pipeline across composites, ceramics, polymers, metallic and alloy systems, energy and critical-mineral materials, and carbon nano/low-dimensional classes, coupled with Al/ML-guided design, scalable synthesis, rigorous characterization, and certification.



Manufacturing centers on an agile, digitally integrated ecosystem: additive and micro/nano-fabrication, AI/ML-integrated design and process control, smart factories, robotics, precision metrology, and surface engineering, with emphasis on indigenous machines, tooling, and secure cyber-physical systems.

The pathway is mission-mode and translational: establish regional Centres of Excellence and 24/7 shared hubs; fund basic and translational R&D with clear TRL-to-MRL progression; catalyse academia-industry-startup consortia to convert prototypes into production and commercialize at scale; secure sovereign IP and resilient supply chains; embed safety and cybersecurity; and prioritise sectors with the fastest routes to certification and scale.

Guiding principles are technological sovereignty, coordinated execution over fragmentation, standards-led certification and interoperability, sustainability-by-design, human-centric automation and safety, open-access infrastructure with measurable SLAs, and partnerships that blend national strengths with international access.

Objectives, visionary yet measurable, include advancing flagship material classes toward TRL 6–8 and MRL 5–7; certifying device families; commissioning national hubs and Centres of Excellence with high uptime and utilization; translating prototypes to pilots and commercial products with rising domestic value addition; localizing critical machines, tooling, and software; training an Industry-4.0-ready workforce; filing high-value patents; and deploying secure cyber-physical systems—delivering leadership, jobs, exports, and affordable, green solutions aligned with Viksit Bharat 2047 and Net-Zero 2070.

Artificial Intelligence

Ministry of Electronics and Information Technology (MeitY)





India is witnessing a transformative leap in artificial intelligence, powered by the India Al mission, which is building a comprehensive ecosystem to foster innovation. In the cabinet approved IndiaAl Mission 2024, the government allocated ₹10,372 crore over five years to strengthen Al capabilities. By democratizing computing, enhancing data quality, building robust infrastructure, and establishing data and Al labs at various centres across the country, the initiative is shaping an ecosystem anchored in cultural relevance, technological sovereignty, and economic independence.

The core components of India's Al Mission are being implemented through consortium-led initiatives such as Bhashini, to develop Indian language tools, and BharatGen to build multilingual and multimodal sovereign foundation models, Bhartiya data set based building, and training; open-source platform for models, data and benchmarks and development of an ecosystem of generative Al research in the country.





BharatGen's models include Param (Text), Patram (Vision), Shrutam (Automatic Speech Recognition), Sooktam (Text To Speech), and the vast Bharat Data Sagar. These technologies are designed to drive innovation across critical sectors such as Governance, Agriculture, Finance, Legal etc.

The strategic goal for India would be weaving Al into the very fabric of society not as a separate layer, but as something that naturally integrates with how systems function, how services are delivered, and how it facilitates ease of living for the population at large. Rooted in local contexts and enriched by the nation's cultural and linguistic diversity, the focus is on creating

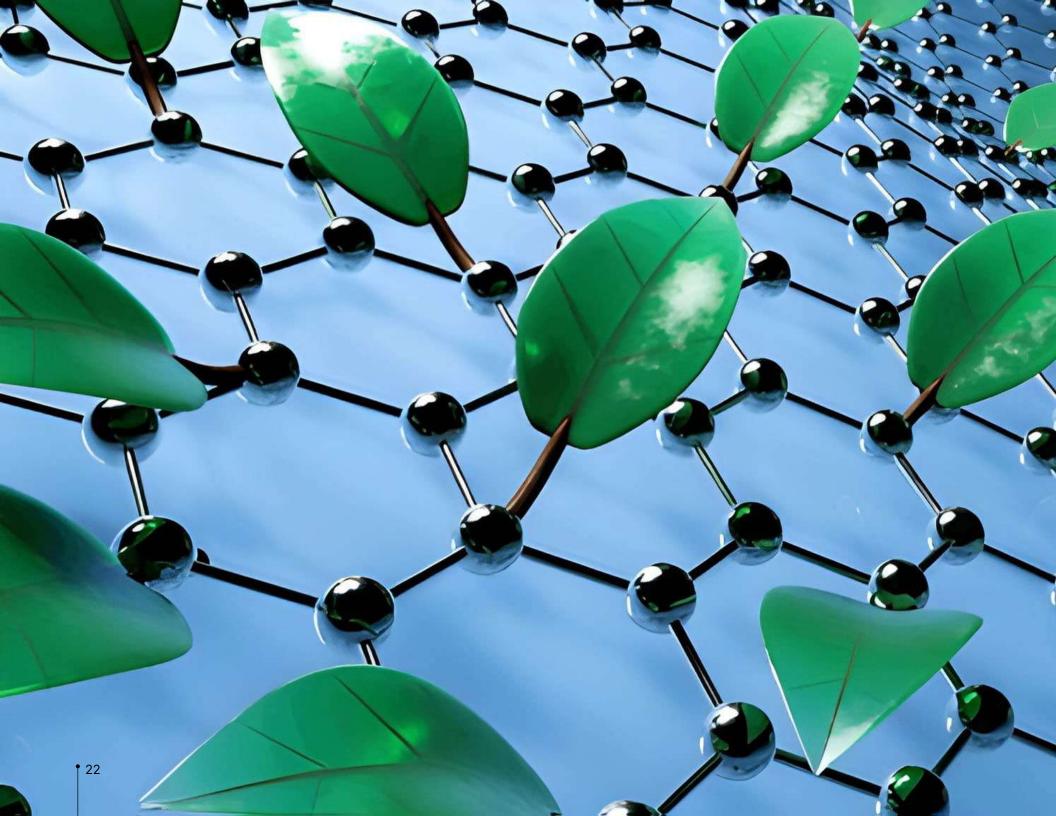
measurable social impact, improving access, efficiency, and equity while fostering sustainable and inclusive development for all with ethical practices.

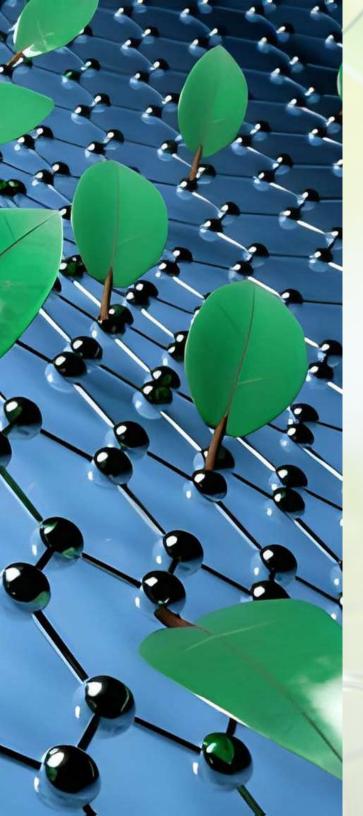
IndiaAl Mission will propel innovation and build domestic capacities to ensure the tech sovereignty of India. It will also create highly skilled employment opportunities to harness the demographic dividend of the country. This Mission will help us demonstrate to the world how this transformative technology can be used for social good while strengthening India's global competitiveness.





BioManufacturing Department of Biotechnology





From Molecules to Miracles! Biomanufacturing is Changing Our World

Biomanufacturing is more than science - it is the future of how humanity will create medicines, materials, and food in a cleaner, greener, and smarter way. Unlike conventional chemical industries that damage the environment, biomanufacturing harnesses the power of microbes, plants, and animal cells to deliver sustainable solutions for health, nutrition, energy, and the environment. Imagine life-saving medicines produced faster and at lower cost, proteins that nourish without exhausting natural resources, plastics that return harmlessly to the earth, and fuels that are renewable instead of polluting.

This is the promise of biomanufacturing: replacing smoke-belching factories with living systems that innovate for life. The field is advancing at lightning speed through synthetic biology, advanced fermentation, and bio-based materials, with massive global investments accelerating its reach. India, already celebrated as the "pharmacy of the world," is uniquely positioned to lead this transformation and is charting the path to a \$300 billion bioeconomy by 2030. To achieve this, the Government of India has launched the visionary BioE³ Policy, linking economic growth with environmental stewardship and new employment opportunities.





This mission aligns with national commitments to a Net-Zero Carbon economy and the Lifestyle for Environment (LiFE) movement. At its core, India's biomanufacturing program focuses on six frontier areas:

- i) Bio-Chemicals & Enzymes
- ii) Functional Foods & Smart Proteins
- iii) Precision Biotherapeutics
- iv) Climate-Resilient Agriculture
- v) Carbon Capture & Utilisation
- vi) Futuristic Marine & Space Research

Through innovation, collaboration, and leadership, India is building a sustainable, bio-driven future where biology powers industry, strengthens resilience, and ensures a healthier planet for generations to come.

Blue Economy Ministry of Earth Sciences



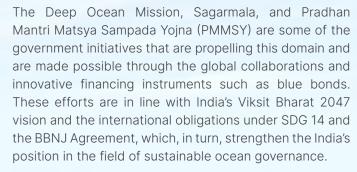


India's Blue Economy: A Journey Towards Sustainable Oceans

Where the rhythm of waves meets the pulse of progress, India's oceans tell a story of boundless potential. With a magnificent 11,098-kilometre coastline and a 2.4 million sq. km Exclusive Economic Zone, the nation's blue economy stands as a living bridge between nature's abundance and human aspiration. These vast waters are not just a source of livelihood, they are a canvas of opportunity, where economic growth, environmental balance, and social inclusion flow together in harmony.

The blue economy is a lively spectrum that includes fisheries and aquaculture, which provide food security and both directly employ people and support households; maritime transport and shipping, the main engines of global trade and logistics; marine non-living resources, developments that take advantage of the ocean to provide minerals and energy for industrial growth; offshore renewable energy, using the power of the wind and waves to clean the future; coastal tourism, a mix of economic development and cultural and ecological preservation; marine biotechnology, which is the major innovation source for the pharmaceutical industry and sustainable materials; and deep-sea exploration, which is the dominant frontier for science and resource discovery.





The scientific, political, and business worlds are coming together to create a future in which economic growth and environmental protection go hand in hand.

India's blue economy is more than an opportunity; it is a responsibility. A responsibility to our oceans, our people, and generations yet to come.





Digital Communications

Ministry of Education & Department of Telecommunications



India's Digital Communication vision for 2047 envisions a comprehensively connected ecosystem where ubiquitous, secure, and affordable networks transform education, healthcare, industry, and governance. The goal is to establish India as a technologically self-reliant "Telecom Product Nation" characterized by indigenous innovation and inclusive digital access.

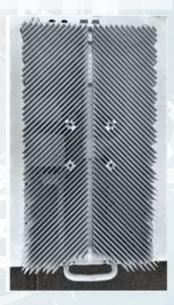
From Consumer to Innovator

Over the past decade, India has evolved from a major consumer of digital services to an emerging hub of telecom innovation. With over 1.2 billion mobile connections and among the world's most competitive data tariffs, India has achieved remarkable digital penetration. The development of an indigenous 4G core, deployment of 5G Use Case Labs across 100 institutions, and advancing 6G research demonstrate India's growing technological capabilities.

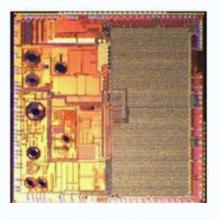
ORAN Massive MIMO Radio compliant with open, interoperable and intelligent networks - developed under NMICPS funding by COMET foundation and IIT Hyderabad







NB-IoT and Satcom Modem SoC for Massive Internet of Things Application

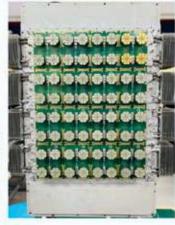


Key Features:

- NB-IoT Modem
- 5G NTN Modem with L-Band Support
- Standards Compliant: 3GPP Rel. 13/14/17, GCF
- GNSS, NAVIC Integrated
- Support for Sensor Hub and TinyML
- · Ultra Low Power Consumption
- Compact Design: QFN60 package
- Design-In Support: Module & BSP available

3GPP/ORAN compliant massive MIMO RRH developed and deployed as a part of the end-to-end system developed for the 5G testbed project being used by companies/startups to test their products.





3 sector Bharat RAN Cell Site at IIT-Hyderabad Campus, such 12 sites are working across the country



Strategic Framework and Initiatives

The Telecommunications Act, 2023 establishes a modern, digital-first regulatory architecture that simplifies governance, optimizes spectrum allocation, and fosters innovation while ensuring secure and affordable services.

Key initiatives driving self-reliance include the Bharat 6G Mission for next-generation wireless leadership, the Telecom Technology Development Fund (TTDF) supporting indigenous R&D and commercialization, and the PM GatiShakti RoW Policy streamlining infrastructure deployment.

Focused efforts to develop domestic capabilities in RF components, filters, amplifiers, and telecom chipsets are reducing import dependence and strengthening technological sovereignty. Institutional reforms are empowering startups and MSMEs, while Digital Public Infrastructure (DPI) ensures inclusive access across urban and rural communities.

Vision 2047: Global Leadership

By 2047, India aspires to be a global leader in digital communication technologies, not merely adopting but actively shaping international standards. Through sustained investment in research, manufacturing, and skills development, India is building a resilient, innovation-driven ecosystem that delivers secure, affordable connectivity and drives economic prosperity, social inclusion, and technological sovereignty.

Electronics & Semiconductor Manufacturing

International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) & Defence Research and Development Organisation (DRDO)







ESTIC-2025 stands as a testament as enduring commitment to fostering innovation, nurturing scientific talent, and strengthening India's defence ecosystem through self-reliant technological excellence. It displays the dynamic interface for industry-academic-DRDO collaboration, encouraging the translation of research into deployable solutions.

With the theme "Imagine * Innovate * Inspire for Viksit Bharat 2047," ESTIC-2025 aims to highlight India's growing technological capabilities and the collaborative spirit driving the nation toward Atmanirbhar Bharat. It unites the nation to showcase cutting-edge innovations, technological advancements, research excellence and live demonstration of breakthrough technologies across domains such as Artificial Intelligence, Quantum Technologies, Advanced Materials, Electronics, Cyber Security, Sensors, Space Systems, and Defence Platforms.





Electronics and Semiconductor are the foundation to a hyperconnected world undergoing an Al transformation and an energy transition. Electronics hardware combined with software, underpins modern civilization. Semiconductor domain is unique in that it is driven by highly globalized value chain and developing technologies for future technology generations. The size of global semiconductor market is predicted to cross USD 1 trillion by 2032. This industry is backbone of any nation's economy. The India semiconductor mission has embedded upon an ambitious program to build up strength in the country. Together nation is working towards enumerating strengths and weaknesses of India semiconductor ecosystem so that India can be among top three in the world in semiconductors by 2036, in terms of research innovation and workforce development metrics. All the agencies are synergizing towards propelling nation being leadership in Electronics and Semiconductor manufacturing.

Emerging Agriculture Technologies Indian Council of Agricultural Research (ICAR)





Emerging Agriculture Technologies: A Vision for Sustainable Transformation

Indian agriculture, despite persistent challenges like climate change, shrinking landholdings, depleting resources, growing food demand and labour shortages, continues to demonstrate resilient growth and contribute in national economy. To accelerate this progress, there is an urgent need to reimagine agriculture through Emerging Agriculture Technologies (EAT)—focusing on precision farming, farm automation, and omics-based innovations.

This vision aligns with national goals such as climate-smart agriculture, enhanced productivity, nutritional security, increased farmer income through value addition and Atmanirbhar Krishi. The thematic area EAT under ESTIC-2025 aims to serve as a catalyst for deliberation and convergence of engineering, biological sciences, and digital technologies for building resilient, efficient, and inclusive food systems.

Globally, countries are advancing rapidly with Al-powered robotics, UAVs, smart sensors, and omics-based crop design. In India, technologies like drones, robotic weeders, smart sensors, and monitoring systems are being developed by ICAR and other institutions. However, challenges such as high costs, small landholdings, digital divides, and limited policy support hinder widespread adoption.





India boasts strong genomic research capabilities, though still developing in agri-robotics and synthetic biology. Controlled environment agriculture, speed breeding, and vertical farming are gaining traction but remain capital-intensive.

To position India as a global leader in climate-resilient, tech-driven agriculture by 2047, the vision includes:

Establishing Centres of Excellence in Al, robotics, omics, and precision agriculture

Creating dedicated capacity-building hubs for farmers, youth, scientists, and agri-entrepreneurs

Investing in long-term infrastructure, supportive policies, and innovation ecosystems

Forging strong public-private partnerships and enabling inclusive technology access

Ensuring ethical, legal, and social safeguards for emerging technologies

India has the scientific talent, innovation potential, institutional strength, and urgency to lead this shift. If pursued with strategic intent, collaborative effort, and visionary leadership, India can not only overcome its domestic agricultural challenges but also set a global benchmark for sustainable, technology-driven food systems & models for sustainable agriculture.

Energy, Environment & Climate Department of Atomic Energy





Energy, Environment & Climate

India, the world's fourth-largest economy in nominal GDP terms, is on track to become the third-largest in coming years. The country's economy is expected to reach an estimated \$7.3 trillion by 2030 and an ambitious \$30 trillion by 2047, with a per capita income of \$18,000 to \$20,000. India needs to grow at 9% plus annually to make this a reality.

India is currently in the "Medium Human Development" category with a Human Development Index (HDI) of 0.685 and aspires to reach an HDI of 0.9 by 2047, aligning with its vision of becoming a developed nation by its centenary. This requires abundant energy to power the growing economy, highlighting a critical link between the economy, energy, and HDI.

India's current energy demand of approximately 10,500 TWh is projected to increase three to fourfold by 2047 to nearly 28,000 TWh to support the \$30 trillion economy. However, this growth must be balanced with its commitment to climate change and its net-zero goal by 2070. India stands committed to reduce Emissions Intensity of its GDP by 45 percent by 2030, from 2005 level. This presents a unique and complex challenge: achieving an eight times growth in the economy, 3-4 times increase in energy supply, and a simultaneous halving of emissions within the next two decades. This challenge, unprecedented for a developing nation, is also a significant opportunity for India to become a "developed nation" (Viksit Bharat) through technological innovation.





The report addresses this in a concise manner and brings out the critical levers which will enable India to reach its cherished goal of a "growing responsibly while becoming rich" while "retaining the vitality of young demography before we become old". That is perhaps what our Hon PM's clarion call of Viksit Bharat@2047. And the unambiguous message is that India can become Viksit only by being a country which works at the cutting edge.

Health & Medical Technologies Department of Health Research (ICMR) and Ministry of Ayush





Health and Medical Technologies: Innovating for a Healthier India

Imagine a future where innovation heals, technology empowers, and care reaches every corner of the nation. The Health and Medical Technologies initiative envisions exactly that — a transformation of India's healthcare system through the fusion of cutting-edge science, indigenous knowledge, and inclusive policy.

It aligns with the national vision of Viksit Bharat (Developed India) by 2047, aiming to position India as a global leader in health technology and biomedical innovation, including the holistic AYUSH system. Guided by the One Health Approach and early Health Technology Assessment, the initiative seeks to build a self-reliant, equitable healthcare ecosystem under the spirit of Atma-nirbhar Bharat, fostering indigenous innovation and reducing dependence on imports.

Key strategies focus on empowering startups and small industries to design local solutions, developing affordable Al-integrated health healthcare tools for rural and remote regions, investing in domestic manufacturing, and establishing holistic health centres based on evidence-based AYUSH practices. Plans also include creating medical device IP and incubation cells in leading institutions, integrating digital learning into medical education, and expanding telemedicine services to every primary health centre.

India already stands as a global healthcare powerhouse — the third-largest producer of pharmaceuticals, generic drugs, and vaccines. Strengthening this leadership, the National Digital Health Mission — Ayushman Bharat Digital Mission (ABDM), launched in August 2020, is building a nationwide digital health ecosystem. MedTech Mitra, launched in December 2023 by ICMR and CDSCO under NITI Aayog's Atal Innovation Mission, supports innovators through clinical evaluation and regulatory pathways.

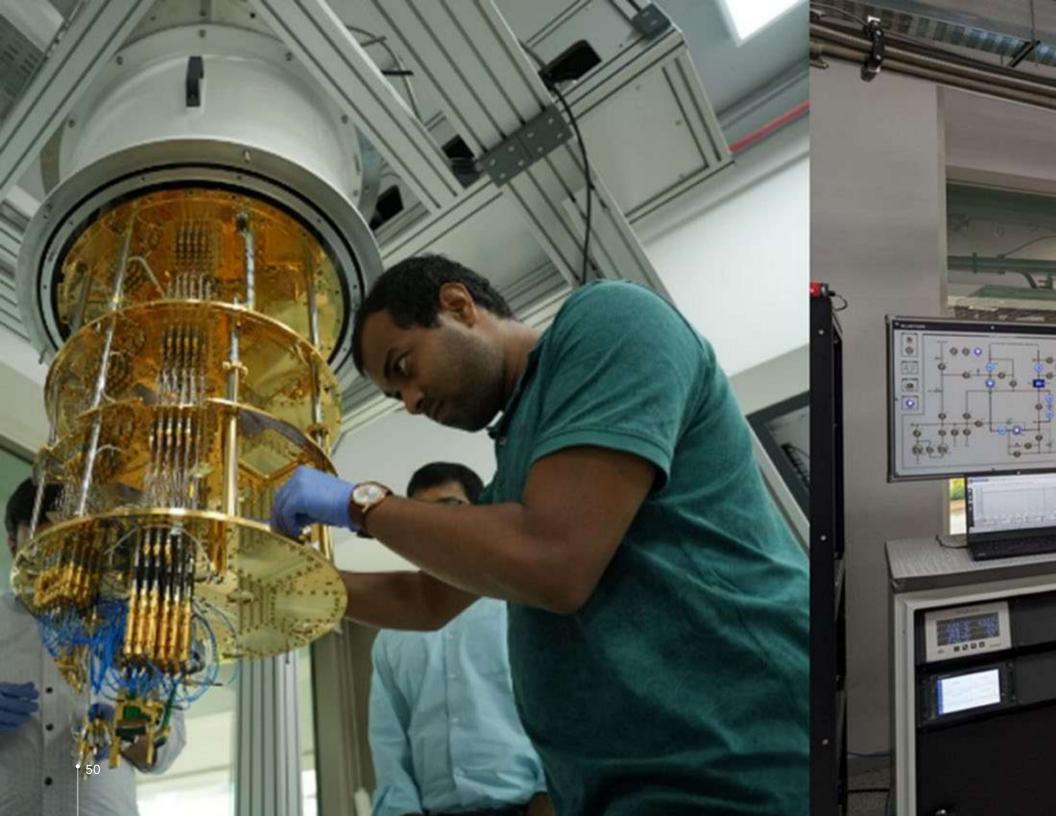
The Health Technology Assessment in India (HTAIn), established in May 2023, ensures transparent, evidence-based health decisions. In October 2025, India and the World Health Organization (WHO) signed an MoU to host the Second Global Summit on Traditional Medicine—a step reaffirming India's role as a pioneer in blending tradition with technology for a healthier world.





Quantum Science & Technology

Department of Science & Technology

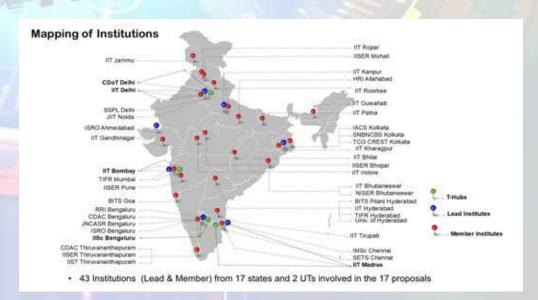


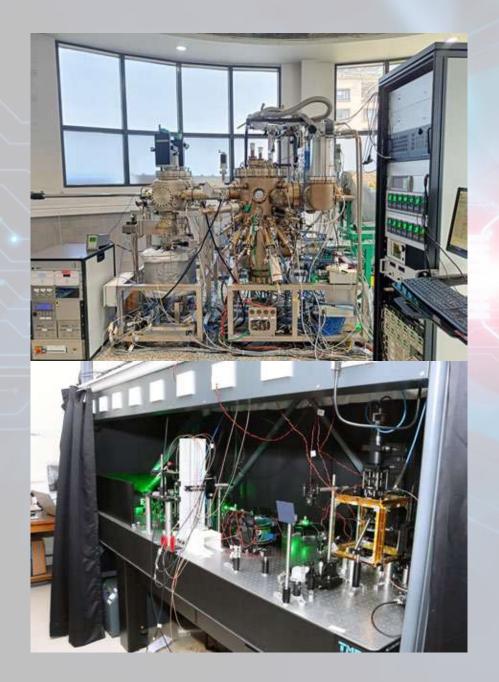


Quantum Science & Technology: India's Vision 2047

Imagine a world where computers think at the speed of light, communication is absolutely secure, and sensors can detect the subtlest changes in the universe. This is the promise of Quantum Science and Technology (QST)—the next great frontier of human innovation. By harnessing the strange yet powerful laws of quantum physics, QST is set to redefine how we compute, communicate, and explore the world around us. By 2035, it is projected to unlock \$1–2 trillion in global value, transforming key sectors such as national security, healthcare, finance, energy, and climate research.

Launched in 2023 with ₹6,003.65 crore, the National Quantum Mission (NQM) positions India to become a quantum-powered economy by 2047, aligned with the vision of Viksit Bharat.







In 2024, four Thematic Hubs (T-Hubs) were established: Quantum Computing in IISc Bengaluru, advancing scalable quantum computers; Quantum Communication in IIT Madras with C-DOT, developing satellite and fibre-based QKD systems; Quantum Sensing & Metrology in IIT Bombay, creating ultra-precise magnetometers, sensors and atomic clocks. Quantum Materials & Devices in IIT Delhi, innovating next-generation quantum materials and devices. The initiative with the hubs connecting a network of institutions across India aims to drive technology development, nurture human capital, promote entrepreneurship, and enhance international collaboration.

Together, these hubs bring 152 researchers from 43 institutions across the nation, driving technology development, entrepreneurship, and global partnerships. Notable achievements include a diamond-based portable magnetometer at IIT Bombay and a Quantum Material Growth Laboratory at IIT Delhi.

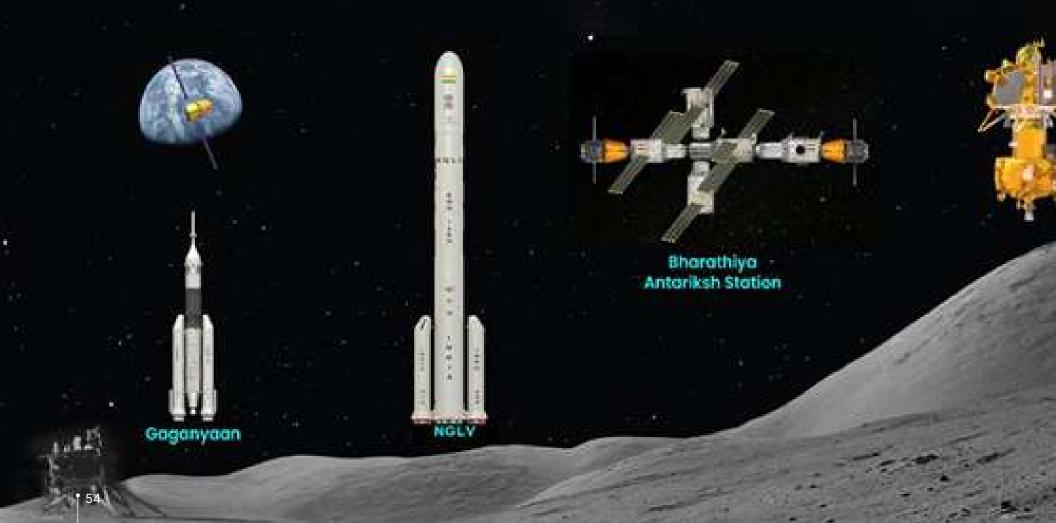
NQM is nurturing a vibrant quantum startup ecosystem, with eight startups onboarded and many more in the pipeline. Key milestones are QpiAl Indus, India's first 25-qubit superconducting quantum computer and quantum security platform Qshield by QuNu labs. To build a future-ready workforce, NQM introduced a B.Tech Minor (2024) and M.Tech in Quantum Technologies (2025), training nearly 2,000 faculty members nationwide.

With bold execution, India is poised not just to participate but to colead the global quantum revolution—building a future of innovation, economic strength, and strategic self-reliance by 2047.



Space Technologies **Department of Space**

Innovation beyond Earth bound: India's Space Vision 2047





India started a very unique space programme in the early formative years of the nation, focused on the benefits of space technology to national development. The founding visionary, Dr. Vikram Sarabhai, shaped the space programme in such a way that we are second to none in the applications of space technology for the benefit of the common man of India.

India's first lunar mission Chandrayaan-1, discovered water molecules on the moon in its first mission itself. The second lunar mission, Chandrayaan-2, has the highest resolution camera (28 cm) in the world that continues to map the moon.

India became the first country to accomplish the landing mission in the South Pole region of the Moon through Chandrayaan-3.

India achieved successful insertion of Mars Orbiter Mission in its first attempt and became the first country to achieve this milestone in 2014.

India's first solar mission, Aditya-L1, that was launched in 2023, making it the fourth country to launch a solar observatory.

As a precursor to the future Gaganyaan missions, India became the fourth nation in the world to accomplish autonomous docking of spacecraft in space through the SPADEX mission in 2025.

In July 2025, first Indian astronaut or Gaganyatri has safely return back from the International Space Station.

The space industry in India is a crucial driver of economic growth. India's current contribution to global space economy is valued at around \$8.4 billion which is about 2-3%. It is targeted to progressively increase this number to \$44 billion with 8% of global share by 2033.

About 330 space start-ups have come up in the country today from just 1 company about 10 years ago.

Various initiative in the space sector and the goals identified under the Space Vision 2047 will elevate the Indian capability in launch vehicles, satellites, space science and space applications on par with the leading space faring nations by the 2040-45 timeframe and contribute to the vision of Viksit Bharat.







