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From Athens to New Delhi (and Back): Toward a Shared Science Diplomacy Agenda

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Introduction

India and Greece are poised at a pivotal juncture in their bilateral relationship, following the political decision to elevate their ties to a Strategic Partnership in August 2023. Science diplomacy has been receiving increased policy attention¹ and, thus, holds the potential to act as a bridge for such bilateral partnerships and, moreover, enable wider Europe–Asia linkages.² Indeed, there is a timely element to this, as both nations are seeking to expand their scientific, technological, and cultural outreach—India via its global science diplomacy network, led by the Ministry of External Affairs, and Greece through its own respective initiatives. As already explored,³ this creates substantial potential for a partnership that unites innovation, research, and soft power diplomacy for mutual benefit.⁴

The importance of an Indo-Hellenic collaboration is also underscored by the current global strategic environment. As outlined in the OECD Science, Technology and Innovation Outlook 2025, governments tend to leverage science to secure national interests.⁵ Science, Technology, and Innovation (STI) securitisation policies can foster bilateral partnerships for the co-development of critical technologies, while effectively balancing Greece’s European orientation with India’s Indo-Pacific outreach.

Anchored in recent developments such as the reaffirmed 2024 India–Greece Strategic Partnership Agreement and the co-development priorities identified in their Joint Statement, covering maritime, space science, nano-technology, bio-technology, clean technologies/ renewable energy, and Information and Communication Technologies (ICT),⁶ the Horasis India Meeting in Athens in 2024,⁷ and the growing academic and technological cooperation between the two countries (e.g., the MoU between the Indian Institute of Technology Patna and the University of Patras),⁸ this article is policy focused in exploring how science diplomacy can become a key pillar in their evolving relationship. It proposes a threefold framework to institutionalise Indo-Hellenic science collaboration.

First, regarding policy and institutional cooperation, the establishment of a bilateral Science and Technology Cooperation Council could align joint priorities in areas such as renewable energy, blue economy research, maritime technology, digital governance, ICT, and sustainable infrastructure. Second, in the academic and innovation sphere, launching Indo-Hellenic research fellowships, co-funded doctoral programs, and innovation hubs would connect Greek universities, research institutions and firms and India’s premier scientific institutions and enterprises through common participation in Horizon Europe, access to G20 research platforms, and the launch of dedicated bilateral R&D programs. Finally, at the societal and soft diplomacy level, promoting joint science festivals, digital education initiatives, and youth exchange programs would reinforce people-to-people connectivity and public visibility of scientific collaboration.

By integrating India’s experience in leveraging science for global influence with Greece’s strategic role as Europe’s gateway to Asia, this partnership can redefine Asia–Europe cooperation. The envisioned Indo-Hellenic science diplomacy model would contribute not only to enhancing bilateral innovation capacity but also to addressing broader transregional challenges—energy transition, maritime security, and digital inclusion—through dialogue, co-creation, and sustainable scientific exchange.

The Four Pillars of the Indo–Hellenic Science Diplomacy Agenda

Our proposed framework focuses on integrating policy, innovation, soft power, and multilateral engagement across four strategic pillars to ensure sustained and impactful collaboration. Our framework is strategically validated by the documented needs and opportunities in the Asia-Europe Science & Technology Diplomacy Report country narratives (ASEF SciTech reports) for Greece⁹ and India¹⁰, as exemplified by the authors of this article in Figure 1.



FIGURE 1. Four Pillars of the Indo–Hellenic Science Diplomacy Agenda

Pillar 1: Institutional and Policy Coordination

The development of this pillar is directly motivated by the challenges and opportunities cited in the ASEF SciTech reports, ensuring mutual benefit: The establishment of formal mechanisms (S&T Dialogue Mechanism, joint Science Attaché posts, the authoring of Bilateral Roadmap) is essential for Greece. Indeed, such steps could help highlight the importance of S&T diplomacy, which is currently hindered by fragmented actions and a lack of coordination and lacks dedicated S&T attachés⁹, thus addressing a critical institutional gap. In return, Greece offers a promising entry point into the EU for India’s established and expansive system of 83 S&T Cooperation Agreements.¹⁰ We propose three actionable measures designed to result in enhanced policy agility and coordination across ministries (Foreign Affairs, Science and Research, Defence, etc.):

- Create an Indo–Hellenic Science & Technology (S&T) Dialogue Mechanism: This platform will facilitate structured, high-level exchanges between policy, academic, and industry stakeholders to drive long-term scientific collaboration.
- Establish joint Science Attaché posts: These positions will serve as permanent liaisons embedded within embassies to ensure continuous information flow, strategic foresight, and coordination between both nations.
- Develop a Bilateral Roadmap on Science Diplomacy 2030: The roadmap will outline shared goals, implementation milestones, and evaluation mechanisms to maintain focus and accountability through successive administrations.

Pillar 2: Research, Innovation, and Academic Collaboration

The necessity of this pillar is underscored by the strategic objectives of both partners as discussed in the ASEF SciTech reports. On the one hand, it is strategically developed to meet India's core objective of strengthening national security through the co-development of capabilities in critical sectors like space and ICT.¹⁰ Simultaneously, it enables Greece to maximise the value of its R&D ecosystem by integrating its institutions into powerful Asian research networks and securing participation in joint Horizon Europe projects.⁹ It contains the following key actions with the goal of co-funding projects in critical technologies and mitigating shared risks:

- Initiate researcher mobility and exchange schemes: Design and undertake programs that will foster talent circulation, enhance cross-cultural understanding, and build joint research capacity in strategically significant scientific domains.
- Create a Co-Funded Indo–Hellenic Innovation Hub in Athens: Commit resources for the establishment and operation of a hub that will act as a central (place-based) platform for collaborative R&D, technology transfer, and start-up incubation, linking innovators and investors from both nations.
- Enhance collaborative participation in R&D projects: Actively seek out potential partners between the two countries to establish collaborative R&D projects within the scope of Horizon Europe. Also, the two countries should design a dedicated bilateral R&D project funding instrument (as e.g. Greece has initiated with Germany and Israel).

Pillar 3: Diaspora and Soft Power Engagement

Both countries have significant and highly regarded science diasporas in multiple countries worldwide. This pillar is proposed as a shared strategy. As identified in the *ASEF SciTech reports*, there is a recognised need for the Greek establishment of a structured mechanism to network its highly educated diaspora⁹, an effort that can benefit from India's successful VAIBHAV model for promoting "brain circulation" and increasing global influence.¹⁰ This pillar focuses on leveraging human capital through the following soft diplomacy actions:

- Establishment of collaborative science diaspora initiatives: Linking India's scientific diaspora initiatives with Greece's respective pool of experts to connect expatriate researchers for co-developed projects, mentoring, and industry collaboration. This network will strengthen cross-border R&D ecosystems and create long-term partnerships that channel global expertise toward national development goals.
- Nominate joint "Science Ambassadors": Nominating renowned scientists or innovators—to promote bilateral collaboration at international conferences and multilateral platforms such as BRICS, ASEAN-EU, or ASEM, these ambassadors will act as visible advocates for Indo–Hellenic scientific excellence, helping attract global recognition and fostering new avenues for cooperative projects.
- Indo–Hellenic Science and Innovation Forums: Organisation of bi-annual Indo–Hellenic Science and Innovation Forums in collaboration with universities and industry councils to showcase joint technology development, inspired by the India Science Congress and ASEF's science-policy dialogues. Additionally, this format will serve as a practical interface for government, academia, and industry to identify emerging opportunities and align future innovation agendas.

Pillar 4: Trilateral and Multilateral Engagement

The proposed Indo-Hellenic science diplomacy framework could contribute not only at the bilateral level but also at the transregional level. This pillar directly supports Greece's suggested strategic objective to enhance scientific collaboration with Asia, as outlined in the ASEF SciTech report for Greece. It establishes the Indo-Hellenic collaboration as a practical model for Asia-Europe scientific exchange, reinforced by the active participation of both countries in ASEF. As such, this pillar should:

- Institutionalise participation in Asia-Europe Foundation (ASEF) science tracks: Capitalising on both countries' ASEF engagement as an entry point for broader Asian cooperation, this initiative will

position the Indo–Hellenic partnership as a regional connector, promoting policy alignment, joint research outputs, and shared innovation initiatives across Europe and Asia.

Actionable Roadmap and Expected Outcomes

The proposed collaboration framework is anticipated to have a meaningful impact on each pillar and its associated actions. Table 1 outlines the expected outcomes of each pillar.

Table 1: Actionable Roadmap and Expected Outcomes of the Four Pillars

Pillar	Expected Outcomes
Institutional and Policy Coordination	Increased South–North and East–West policy integration linking India’s Indo-Pacific diplomacy with Greece’s European and Mediterranean agenda.
Research, Innovation, and Academic Collaboration	Co-development of capabilities in strategic technologies (e.g., space, ICT); Maximised R&D value through joint funding, Horizon Europe collaboration, and shared risk in frontier technologies.
Soft Power and Diaspora Engagement	Strengthened diaspora-driven innovation ecosystems, converting brain circulation into tangible joint industrial and research outputs.
Trilateral and Multilateral Engagement	Enhanced scientific visibility and innovation exchange, turning both countries into co-shapers of transregional science diplomacy and creating an actionable model for Asia-Europe scientific exchange.

Conclusion

Science diplomacy has been gaining increasing attention in both academic and policy circles in its capacity to enhance collaboration between countries and help initiate (and sustain) knowledge and scientific networks.¹¹ It is, thus, a useful concept upon which to explore the ways in which Greece and India can enhance their bilateral R&D and innovation collaboration. The upgrade of India-Greece relations through the Strategic Partnership in 2023 offers a unique opportunity to strengthen science diplomacy between the two countries. For this article, our four-pillar collaboration framework outlines practical steps and expected results designed to establish a robust model for regional and cross-regional cooperation.

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Trade, Techno-Nationalism and Export Controls: Harnessing Science and Innovation for India’s Strategic Autonomy

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Knowledge as a public good, peer review of science, prominence attached to open publications, and a premium placed on professional recognition and scientific autonomy in governance have remained the hallmark of science for the last three centuries. Robert K Merton, the leading sociologist of science, wrote a classic thesis that led to what has come to be known as the most important ‘paradigm’ of autonomous and open academic science, encapsulated in his ‘ethos of science’ or normative structure of science.¹ This social contract between open science and society, which governed much of our global science system in the post-Second World War era, has undergone a major transformation since the 1990s.² As we transitioned to the 21st century, the emergence of globalisation has challenged the existing science–society social contract, which has prioritised the market and corporatisation of science and innovation.

The wave of globalisation reshaped this landscape in profound ways. The liberalisation of trade, the spread of multinational enterprises, and the free movement of knowledge, technologies, and talent enabled countries such as India, China, and several East Asian economies to develop strong scientific and technological capacities in various ways, transforming their industrial and innovation systems.³ This phase of liberal, democratic and globalised science was characterised by unprecedented international collaboration, cross-border R&D partnerships, and the diffusion of advanced technologies through trade, foreign direct investment and global value chains.⁴

Yet, globalisation also had its problematic dimensions. The asymmetry in technological ownership between advanced and developing nations deepened, intellectual property regimes became increasingly restrictive, and dependence on a few technologically dominant countries persisted. Despite these challenges, the global system still allowed room for international technology transfer and capacity building, enabling emerging economies, particularly in Asia, to integrate into global innovation networks and enhance their domestic technological base.⁵ This delicate balance of cooperation and competition marked the high point of global interdependence in science and technology before the recent turn toward techno-nationalism in the Trump era.⁶

Today, a new phase of techno-geopolitics is unfolding. Trump’s trade policies, the resurgence of techno-nationalism and the tightening of export controls—particularly in strategic materials like rare-earth magnets—represent the three defining pillars of the emerging global technology order.⁶ These measures, aimed at reshaping global supply chains and curbing the transfer of advanced technologies, are intensifying competition among major powers such as the United States and China.⁷ For countries like India, the implications are profound. As global trade and technology flows become increasingly

securitised and restricted, India faces the urgent task of reducing its technological dependence in critical sectors such as semiconductors, advanced batteries, electric vehicles (EVs), and defence manufacturing. Building indigenous capacities through targeted national public and private R&D, strategic industrial policy and partnerships with trustworthy countries will be crucial.

Science and Innovation Missions

Over the past decade, India has launched nearly a dozen major science, technology, and innovation missions aimed at strengthening self-reliance in strategic sectors. In crucial areas such as Quantum Technologies, EVs, Energy, Semiconductors and Active Pharmaceutical Ingredients (APIs), the country continues to exhibit varying degrees of technological dependence on foreign sources. As already pointed out, India's technological autonomy has become indispensable in these fields in the current situation. These national missions are designed to build domestic capacities through public-private partnerships, targeted incentives and focused R&D investments. Their immediate objectives include fostering indigenous research ecosystems, promoting local manufacturing and nurturing human capital in frontier critical technologies. However, the scale of investment and implementation efficiency will determine how far India can reduce its external technological dependence in the coming decade. Given the limitations of space and time, this discussion will focus on a select few critical sectors and issues.

Semiconductors

Having missed earlier opportunities in the 1980s and 2000s, India has now recognised the urgency of developing its indigenous semiconductor capabilities. The Semiconductor Mission, launched in 2021 with an outlay of ₹76,000 crore, aims to address the country's near-total dependence on imported chips. Under this mission, private firms receive 50% co-funding support. Currently, six semiconductor units—including one fabrication plant (fab) and five ATMP/OSAT units, along with the modernisation of the Mohali laboratory—are under construction or nearing completion. Global and domestic players are joining the effort: Kaynes Semicon and Micron (USA) have established units in Sanand, Gujarat, while the two fab units at Dholera, Gujarat—India's first commercial fabrication venture—are being set up by the Tata Group in collaboration with Powerchip Semiconductor Manufacturing Corporation (PSMC), Taiwan. These fabs from Tata are expected to produce 50,000 wafers per month across 28 nm, 40 nm, 55 nm, and 90 nm nodes by early 2026, supplying chips for automotive, AI, wireless communication, and other advanced applications.^{8,9}

In contrast, China operates 44 fabs with 22 more under construction, while South Korea has 21 operational units. As Ajai Chaudhury, co-founder, HCL and current head of Quantum Mission, observed 'out of 190 million mobile phones produced annually, 60% are Chinese, 20% Samsung, and 20% Apple—India still lacks an indigenous brand. We need to establish about a dozen more fabs in the coming years to drastically reduce technological dependence.¹⁰

The Adani Group is planning a collaboration with Israel, while the L&T Group has shown interest in a fabless chip company. Similarly, Dixon Technologies is exploring a technology partner for a display fabrication unit, with a focus on LED and OLED panels. In addition, reports indicate that around 15 semiconductor start-ups are emerging across various regions of the country, which are expected to further strengthen the sector's ecosystem.^{11,12} With 97% of the initial Semiconductor Mission 1.0 (₹76,000 crore) fund already committed, the government must expedite the launch of Semiconductor Mission 2.0—with an expected budget of ₹1.76 lakh crore—to establish additional fabs. It is estimated that nearly 20% of the world's chip-design engineers are based in India, and leading global firms—including Qualcomm, Intel, NVIDIA, Broadcom and MediaTek—operate major R&D centres in the country. India must strategically leverage this strong talent pool to strengthen domestic semiconductor firms and accelerate the growth of a robust, competitive chip-design ecosystem of its own.¹³ We could strengthen and expand the semiconductor design platform to higher levels with the Design Linked Incentive (DLI) scheme.

APIs in Pharma

India has the third-largest pharmaceutical industry in the world, yet it remains heavily reliant on China for critical raw materials, including key starting materials and APIs. In 2014, Ajit Doval, India's National Security Adviser, highlighted serious security concerns, noting that India's dependence on China for APIs was as high as 85%. By 2023, the country's overall import dependence remains above 70%, and for 45 critical APIs, it continues to be entirely reliant on foreign sources.¹⁴ The country's reliance on imports is expected to persist through 2024–25.

Given India's strong scientific base and proven technological capabilities in the pharmaceutical sector, it is striking that the country remains heavily dependent on imports of critical APIs. To address this, India must accelerate indigenous API production through sustained R&D investment, process innovation, and achieving economies of scale. Under the Make in India initiative, the Department of Pharmaceuticals, in collaboration with CSIR, has identified 56 priority APIs. Three schemes, including the Production-Linked Incentive (PLI) Program for pharmaceuticals and bulk drug production, have been allocated ₹25,000 crore over a ten-year period. To effectively overcome this strategic vulnerability, the government should reassess these schemes and consider a greater infusion of funds.

Quantum Technologies

India has established four quantum hubs, focusing on computing, communication, sensing and metrology, as well as materials and devices, involving leading institutions such as the IITs, IISc, C-DOT, and private firms like HCL.¹⁵ However, the current status reveals that India lags significantly behind global leaders. While India has made some progress in quantum publications, it remains far behind leading countries in patents and quantum processing units (QPUs).¹⁶ Between 2019 and 2023, India accounted for just 5% of global quantum computing publications, compared to China's 23% and the USA's 22%. Between 2014 and 2025, China leads in patenting with 7,308 patents, followed by the USA (2,301), Japan (863), South Korea (623), and India (424). QPUs are a key indicator of technological maturity, with the USA leading at 58 units, followed by China with 16, France with 15, the Netherlands and Australia with 9 units each, the UK and Germany with 8 units each, and India with 2 units.

In hardware, IBM recently unveiled Condor, a 1,121-Qubit processor¹⁷ and plans to develop a 100,000-qubit computer by 2033. Google, Amazon, Microsoft and Intel are also advancing with comparable platforms. China unveiled its 504-qubit "Tianyan" chip¹⁸ and ez-Q Engine 2.0, reportedly capable of supporting over 1,000 qubits.¹⁹ Fifty leading Chinese universities and companies have joined a project to explore quantum applications. Among the world's top 10 universities in quantum physics, as ranked in the Nature Index for 2024, four are Chinese, with USTC, Hefei, ranking first.²⁰ India's effort remains nascent: TIFR has developed a 7-qubit system, while a Bengaluru-based start-up announced 25 and 64-qubit processors, aiming to scale up to 300 qubits in the near future. In the medium term, the plan is to develop quantum computers with 50 to 1,000 Qubits within 8 years (2025-2033).

China's public investment in 2022 is 15.3 US\$ billion in Quantum compared to the USA (3.7 billion) and India (1.0 billion). India entered the global quantum technology race relatively late, with the National Quantum Mission and a modest budget (INR 6,003 crore), which limits its immediate ability to compete with countries like the USA, China, and Europe, which have invested heavily in research, infrastructure, and talent development over the past decade. As a result, India faces significant gaps in technological maturity, patenting, and deployment of quantum hardware, making accelerated investment and strategic planning critical to catch up. Technological sovereignty is becoming indispensable as several countries, such as the USA, have imposed high restrictions on the export of quantum computing with more than 34 Qubits and related technologies.

Coal and Nuclear Energy

India remains heavily reliant on coal, which accounts for 48% of the country's total energy supply. Given its continuing importance, India must invest in carbon capture, utilisation and storage (CCUS) technologies

and expand the Integrated Gasification Combined Cycle (IGCC) program. The Department of Science and Technology has recently launched an R&D Roadmap for CCUS. However, since a demonstration CCUS plant can cost nearly \$500 million, collaboration with major coal producers, such as those in Australia, Indonesia, and South Africa, could help develop more affordable solutions. CCUS also offers the potential for producing clean liquid hydrogen. In January 2022, the Hydrogen Energy Supply Chain (HESC) Project in Victoria, Australia, achieved a world first by demonstrating the extraction of clean liquid hydrogen from Latrobe Valley coal via carbon capture, utilisation and storage.²¹ India's coal power giant, NTPC, could integrate hydrogen production into its large-scale coal gasification plans, combining energy generation with the production of cleaner liquid hydrogen fuel.²²

In the nuclear sector, India has yet to fully realise Homi Bhabha's 1950s vision of achieving 8,000 MW of nuclear capacity. As of 2025, 24 reactors generate 7,438 MW, accounting for just 3% of the country's total electricity. To accelerate nuclear capacity growth, the government must fast-track additional Pressurised Heavy Water Reactors (PHWRs). India could also expedite its collaboration with US Company Clean Core Thorium Energy for the development of thorium as an alternative fuel in reactors. The new HALEU (high-assay low-enriched uranium) technology, which blends thorium with a more concentrated type of uranium, can be used in the existing Indian fleet of PHWRs.²³

Given India's substantial endowment of thorium reserves, it is imperative to fast-track the commissioning of the 500 MW Prototype Fast Breeder Reactor (PFBR) at Kalpakkam, Tamil Nadu, which is expected to become operational in 2026. The successful deployment of this reactor will mark a critical milestone in India's three-stage nuclear programme and pave the way for scaling up thorium-based fuel cycles.

A rapid expansion of thorium technologies—supported by targeted public investment, innovative public–private partnerships, and collaboration with advanced nuclear research institutions—could significantly accelerate India's transition toward a more secure and self-reliant energy future. If implemented with urgency and strategic additional investments, thorium-based nuclear power has the potential to be a true game changer, reducing import dependence, enhancing baseload capacity and strengthening long-term energy security.

In 2024, plans were announced to develop 300 MW Bharat Small Modular Reactors (SMRs) under a public–private partnership model, with ₹20,000 crore allocated in 2025.²⁴ India already operates 84 MW SMRs in submarines, and BARC has initiated three demonstration SMRs, with capacities of 200 MW, 55 MW, and 5 MW. To strengthen energy security, India should expedite collaborative projects with Russia, Japan, and France for the development of SMR technology over the coming decade. SMRs may not compete with large-sized reactors in terms of cost per MW of production, but they will be relevant for decentralised energy production in India. Civilian nuclear technology represents a key alternative for significantly reducing India's oil imports.

Batteries in EVs

With nearly 1.75 million EVs on Indian roads, more than 85% of lithium-ion batteries—the most critical component in their manufacture—are still imported. EVs also rely on permanent magnet synchronous motors, braking systems, sensors, and power electronics, most of which are dependent on imported magnets, leaving India around 90% dependent on external suppliers and highly vulnerable technologically.

The PLI scheme has provided strong momentum to domestic lithium-ion battery manufacturing, with major firms such as the Tata Group, Exide, Amara Raja, Ola Electric, and Luminous Power Technologies establishing gigafactories. Additionally, the government's decision to reduce GST on locally produced EVs and charging stations from 12% to 5% is expected to further boost domestic production and reduce import dependence. The EV industry must urgently expand downstream activities in the mining, processing, and supply chains of critical raw materials and explore alternatives to lithium-ion batteries to enhance self-reliance. 'It takes 682 times more water to extract one tonne of lithium versus one tonne of sodium. The sodium-to-lithium ratio in the Earth's crust is 23,600 parts per million (ppm) to 20 ppm. The natural abundance of sodium results in a significantly lower extraction cost.'^{25,26} There are solid-state batteries, which are safer

and can have higher energy density. Other emerging technologies with potential include graphene, zinc-based batteries and hydrogen-powered cars.

The National Green Hydrogen Mission, launched in 2023, involves schemes worth INR 19744 crores until 2030.²⁷ India has not yet achieved its ambitious goal of producing 5 million tons of green hydrogen per year, primarily due to slow project commissioning and infrastructure issues.²⁸ Benchmarking against global leaders like Chinese CATL²⁹ and BYD, India’s investment in hydrogen and EV-related activities remains dismal, underscoring the urgent need for greater public-private R&D and innovation funding to build a robust indigenous EV and clean mobility ecosystem.

Are we Investing Enough in R&D?

Funding for S&T and research-oriented higher education has been a persistent challenge for India. One key indicator of national commitment to research is GERD as a percentage of GDP, which measures the total investment—by government, industry, and academic institutions—devoted to R&D relative to the size of the economy. Despite ambitious policy initiatives and the growing importance of technology-driven development, India’s GERD as a share of GDP has remained relatively stagnant over the last three decades.

Public R&D

In the 1990s, GERD accounted for approximately 0.8% of GDP, but by 2025, it had slightly receded to around 0.7%. More than 50% of GERD is allocated to strategic sectors of atomic energy, space, and defence. The rest, spread across various sectors and programs, pose constraints in realising the objectives of these programs. The comparative growth of GERD/GDP for India and China is shown in Table 1. In terms of purchasing-power parity (PPP), India’s GERD in 2023 is approximately US\$ 71.3 billion, whereas China’s figure of GERD stands at US\$ 723 billion.³⁰ Further, while India’s total R&D spending has grown in absolute terms over the past decades, the private sector’s share of GERD has remained relatively low, hovering around 35–40%, compared to more than 70% in countries like China.

Table 1: R&D Expenditure as Percentage of GDP & S&T Output: India vs China (1990–2025)

Year	India GERD/GDP %	India S&T Output*	China GERD/GDP%	China S&T Output*
1990	0.8	10113	0.5	6407
1995	0.62	10907	0.7	9624
2000	0.74	21000	0.9	22702
2005	0.81	24000	1.3	36985
2010	0.82	60555	1.7	308769
2015	0.7	80195 (2013)	2.1	351526 (2013)
2020	0.64	149213	2.4	669744
2021	0.66	-	2.5	-
2022	0.7	-	2.6	-
2023	0.7	228174	2.6	932712
2024	0.65	-	2.7	-
2025	0.7	-	2.8	-

*Based on National Science Foundation (NSF) and Web of Science Data

Private Sector R&D

Historically, one of the key reasons for India’s low GERD-to-GDP ratio has been the limited contribution

of the private sector to R&D spending. Globally, industry accounts for nearly 70% of GERD in countries such as South Korea, Japan, and across the OECD. In contrast, in India, the share of private sector R&D expenditure remained stagnant at around 25–30% from the 1990s until 2015 and has only marginally increased to 35–40% in recent years. As Naushad Forbes of the Confederation of Indian Industry points out, private R&D spending in India still amounts to a mere 0.3% of GDP, compared with a global average of 1.5%. This raises an important question, as Forbes argues: if foreign multinationals can leverage India's talent pool so extensively, why have leading Indian firms such as Reliance and L&T not made comparable investments in R&D?³¹ The Office of the Principal Scientific Adviser study in 2023–24 on the state of private sector R&D in India reveals that out of 1,000 listed firms reviewed, the report was able to identify only the top 20 R&D-intensive companies for 2022 and 2023. The top 20 out of 911 Indian firms accounted for 71% of the country's total R&D expenditure in 2023.³²

Timely Intervention

The chronic underinvestment in scientific research has long been acknowledged as a structural barrier to effectively linking India's S&T policies with its broader innovation and development goals. In response, the government has introduced several major S&T and R&D funding schemes in recent years. These initiatives mark a significant shift toward mission-oriented innovation and represent early steps toward bridging India's scientific and technological gaps.

Anusandhan National Research Foundation (ANRF) was created in 2023.³³ It was charged with disbursing US\$6 billion to universities and laboratories over a 5-year period, with 70% of the funding coming from non-governmental sources and industry.³⁴ The overall budgetary provision for ANRF is INR 1 lakh crore, equivalent to approximately 11.34 US\$ billion. The government, in its 2025 budget, allocated INR 20,000 million or US\$ 235 million.

Research, Development, and Innovation (RDI) Scheme came into operation in July 2025, backed by a substantial budgetary allocation of ₹1 lakh crore (approximately US\$ 11.34 billion).^{35,36} The RDI Scheme is designed to catalyse private sector participation in high-impact, cutting-edge research and innovation, ensuring that the commercialisation of scientific breakthroughs is closely aligned with national development priorities.³⁷

Vigyan Dhara scheme came into effect in January 2025.³⁸ The scheme is allocated INR 14,250 million, or approximately US\$ 167.64 million.

*Capacity Building and Human Resource Development Scheme*³⁹, with a total outlay of INR 22770 million, was launched recently on 24 September 2025. It is implemented by the CSIR and will cover all R&D institutions and Universities across the country.

Towards Strategic Autonomy

In this evolving environment of new techno geo-politics, India must balance openness with self-reliance to safeguard its economic and strategic autonomy. This landscape underscores the urgent need to build robust indigenous research ecosystems, secure technological sovereignty and forge balanced international partnerships that safeguard national interests while sustaining innovation. In an era where critical technologies are increasingly being weaponised, technological sovereignty is no longer optional—it has become a strategic imperative. While India has already launched several vital initiatives across key sectors, the emerging geopolitical landscape demands a significant escalation of these efforts. The time has come to deepen investments, strengthen institutions, and accelerate the push toward genuine strategic technological autonomy.

R&D and Innovation: Several of the recently launched schemes are strategically designed not to rely solely on public expenditure but to use government funding as a catalyst for mobilising large-scale private investment. For example, more than 70% of the ANRF's projected ₹1 lakh crore budget is expected to be funded by industry participation. This, however, raises a critical concern: what happens if private funding does not materialise at the scale anticipated? India has launched nearly a dozen major

science, technology, and innovation missions to strengthen self-reliance in critical technology sectors. The present Indian government—unlike any previous administration—has earmarked close to ₹4.0 lakh crore for various critical technology missions over five years through public–private partnership models. However, benchmarking against leading innovation economies such as the OECD countries, Japan, South Korea, and China shows that India must sustain and significantly expand public investments in science, technology, and higher education research to remain competitive and realise its long-term technological ambitions. To make tangible progress in strategic missions and frontier technologies, the government should raise public R&D spending to at least 1.2% of GDP and simultaneously encourage the private sector to double its share from the current 0.3% to 0.6% of GDP per annum within three years, with a 10% increase per annum thereafter.

Public Procurement: In several missions aimed at building indigenous capacities in emerging technologies, the missing link is the creation of strong domestic demand. Taking a cue from China, the government could adopt strategic public procurement as a key instrument across sectors such as semiconductors, EVs, advanced batteries, and quantum technologies. Addressing this gap would not only support domestic industry in scaling up but also strengthen its ability to compete globally.

Research Intensity in Universities: The data on research output from universities indicate that this sector contributes approximately 70% of total publications but accounts for less than 7% of Gross Expenditure on Research and Development (GERD) in 2020. The low level of R&D effort and research intensity in Indian universities is closely associated with a relative stagnation or decline in the number of postgraduates and PhDs produced. The new capacity-building scheme in universities will address this problem, but not the research intensity of universities. Marginalisation of research funding and low intensity of research are not unrelated to the low level of innovation and university-industry relationships in universities.

'Triple Helix' Linkages: Systematic policy support and targeted funding for a select group of universities, such as IISc and the IITs, can play a pivotal role in fostering Triple Helix partnerships between science agencies, industry, and academia within the national innovation system. The IIT Madras model—with its innovation parks, spin-off firms, venture capital, technology transfer offices, incubators, and other supporting mechanisms—illustrates how focused efforts in just 10% of universities have become indispensable steps toward achieving strategic autonomy.

Start-ups and Venture Capital: Over the past five years, state intervention in the development of start-ups and venture capital in India has injected significant dynamism into the national innovation system. The country now needs to intensify its efforts in both sectors to sustain and accelerate this momentum in the years to come.

Achieving these targets would not only reinforce India's scientific and technological foundations but also bolster its economic resilience, enhance competitiveness, and secure greater strategic autonomy in an era marked by rapid global technological change and geopolitical uncertainty. By systematically strengthening research, innovation, and industry linkages, India can position itself to respond effectively to emerging challenges and seize new opportunities on the global stage.

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Competing in a Science-Driven World: Time to Scale-up Indian Science Diplomacyⁱ

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Long before the term ‘science diplomacy’ was formalised, the young Indian republic was already putting it into action. In 1955, Dr Homi J. Bhabha chaired the maiden International Conference on the Peaceful Uses of Atomic Energy in Geneva. It was a brave endeavour in a world that was creeping into the polarised Cold War era. At a time when very few newly independent countries possessed such capabilities, Dr Bhabha wielded his scientific standing and persuasive persona to position India as a legitimate actor in nuclear science. India spearheaded the formation of the International Atomic Energy Agency (IAEA), championing international cooperation and the “inalienable right of States”.¹ Access, equity, and engagement with the Global South, which dominate today’s diplomatic lexicon, were at the centre of India’s early global scientific engagements.

Today, India desires to ride the wave of disruptive innovations in science and technology to propel its next phase of growth. India’s own R&D ecosystem is flourishing at breakneck speed with technology hubs, deep-tech initiatives, start-ups, and mission-mode programmes. India has established itself as a leader in space research, digital public infrastructure, and biotechnology. The country is aspiring to become a leader in Artificial Intelligence (AI) and Quantum Technologies through focused mission-mode programmes. Therefore, its international Science, Technology and Innovation (STI) diplomatic mechanisms must expand in parallel. Expanding India’s STI diplomacy is no longer optional: it must assume a central role in protecting strategic interests and shaping our international discourse across domains.

The Window of Opportunity

India has positioned itself as the fourth-largest economy, exceeded its renewable energy goals, and is now the third-largest producer of scientific outputs, while also making significant strides on the Global Innovation Index. However, India’s Department of Science and Technology (DST), under the Ministry of Science and Technology (MoST), has just four “Science Attaché” positions in Berlin, Tokyo, Washington D.C., and Moscow.² These Attachés advise the Indian Missions on scientific and technological matters, report the latest developments in the host country to the DST, represent India on relevant forums advancing Indian interests, foster collaborations, facilitate networking, and showcase the scientific and technical prowess of India. Indian Missions in locations like Austria (Vienna), France (Paris), and the UK (London) host technical liaison officers who focus on specialised areas such as space, defence, and atomic energy. However, these officers represent specific departments such as the Department of Space or Atomic Energy

ⁱ Views in the article are of the authors and do not belong to the organisation they represent.

and do not represent the holistic Indian STI sector. Therefore, it is imperative to ask if the current STI diplomacy framework of India needs to evolve to match the pace of STI growth in the country.

The limited STI diplomatic presence hinders India's global engagement and remains disproportionately concentrated towards the Global North. Consequently, India risks reduced visibility on international platforms, especially in rapidly growing science networks in the Global South. Capacity constraints compound this problem. Career diplomats remain stretched as ever; there is a lack of trained scientific personnel to advise, engage, and proactively advance India's STI interests globally.

Many countries with comparable scientific outputs,³ including G7 countries, maintain widespread overseas science and technology missions. China claims to have more than 60 overseas STI diplomacy locations.⁴ As a result, Indian voices risk being excluded from science diplomacy discourses that influence funding priorities, regulatory frameworks, and frontier research alliances.

Evolving with the Times

The history of Indian science diplomacy reveals dynamism. While the first phase secured long-term strategic interests on the global stage, phase two leveraged global partnerships to address structural deficiencies domestically. The first crop of IITs at Kanpur, Delhi, Bombay, and Madras was set up through collaborations with the USA, UK, USSR, and Germany, respectively. Through infrastructural support and knowledge transfer, these "temples of Modern India" provided a solid technical foundation to propel India forward. This model of developmental science diplomacy reached its zenith with the Green Revolution. By linking international agencies with the budding national agriculture R&D setup, India put an end to years of relying on ship-to-mouth support.

Building on its strong domestic scientific base, India transitioned from aid-based to partnership-based science diplomacy as it neared the turn of the millennium. India also began to adopt a more assertive multilateral stance, based on shared challenges and multidimensional interventions. India has been a prominent voice in advocating for global cooperation and equity in critical areas, such as climate technologies, renewable energy, access to medicines, and the protection of traditional knowledge. Through the reinvigoration of the Indian Technical and Economic Cooperation (ITEC) programme⁵, ISRO-enabled technologies⁶, and more recent vaccine diplomacy, India has invested heavily in providing technologies for the global public good. By launching multilateral networks such as the India, Brazil, South Africa (IBSA) Fund for Poverty and Hunger Alleviation, and the International Solar Alliance, India is setting the agenda for next-generation collaborations.

While India has a strong domestic STI base and an assertive multilateral presence, the complexity and pace of modern STI demands a dedicated diplomatic interface. Pandemic preparedness, critical minerals, genomics, green tech, and cybersecurity are just some of the areas that highlight the centrality of international science cooperation. For India, structured scientific representation on global fora can ensure continued influence, especially in the Global South, in putting forth equitable, shared development perspectives in international policy.

At present, however, India's science diplomacy efforts are scattered across various institutions, including the DST, DBT, MoES, CSIR, ICMR, ISRO, and DAE, that are anchored through the Ministry of External Affairs. Each of these agencies has an international cooperation vertical that engages with STI diplomacy teams of foreign countries based in India. But today's technologies break down the siloes of traditional disciplines: synthetic biology intersects with AI, quantum technologies lie at the core of commerce and defence. This exposes potential vulnerabilities in the current segregated approach. The lack of a dedicated channel impairs global engagements due to unnecessary duplication, gaps in coverage, and slower response times.⁷

Powering the Next Phase

The next phase of India's long, multifaceted STI diplomacy journey should focus on institutionalising the

link between scientific expertise and diplomacy. Previous successes relied heavily on towering personalities like Dr Bhabha and Dr Sarabhai, who held considerable global sway through their eminence and stature. India cannot continue to rely on serendipity alone and must build consistent structural STI diplomatic prowess. A cadre of trained science diplomats can help bridge the gap between cutting-edge research and policy goals. These science diplomats can accelerate international collaborations and ensure India's scientific and developmental voice remains strong, consistent, and heard on the world stage. This urgent task can aid the transition from fragmented, capacity-constrained engagement to a more empowered and future-ready STI diplomacy backbone.

Adapting successful global models can be a strong starting point. The Swissnex model is an instructive example of a distributed, innovation-driven network that enables a variety of stakeholders, not just the government, to build partnerships in science, start-ups, education, arts, and culture. Even though India produced 10 times more science and engineering publications than Switzerland in 2023⁸, Swissnex operates six global locations with approximately 20 science and technology offices and science counsellors across the world.⁹ This strong network has a visible impact. In 2023, around 74% of Switzerland's scientific publications were internationally co-authored, one of the highest collaboration rates in the world compared to just 24% in India.¹⁰

These science diplomats should be housed in permanent, expert-driven science diplomacy hubs overseas, rather than the current short-term deputations. While co-located and closely working with Indian missions, they should be mandated to map strategic breakthroughs, support Indian research, build bilateral networks, build on-ground presence, advocate Indian STI, attract collaborations, and nurture the link between the host and home countries. They can also advocate for Indian start-ups, provide insights into the host country's markets, and facilitate market expansion.

The UK Science, Technology and Innovation Network (STN), with over 130 staff at 65 global locations, helps project the UK's science and technology excellence internationally, facilitates collaborations, and offers science-policy insights to the UK government.¹¹ It also hires and works closely with local talent, building important, insightful relationships. Similarly, India needs focused efforts to globally position itself as a leader in affordable innovation at scale, by creating and leveraging an expansive network of STI diplomacy hubs. Such efforts are crucial to expand India's soft diplomacy in the Global South, especially with strategic partners such as Brazil, South Africa, and Singapore.

Furthermore, science diplomats and dedicated channels can help India utilise previously untapped opportunities. They can facilitate connections among academics, start-ups, industry, and NGOs on an international level. A dedicated pool of technology and innovation experts, trained in international affairs, could create new opportunities for the Indian STI ecosystem. Similarly, Indian diaspora researchers can be roped in by these science diplomats to extend and strengthen global networks that bring mutual benefits to host and home countries.¹²

India's historical successes, ranging from Dr Bhabha's nuclear diplomacy to the more recent Coalition for Disaster Resilient Infrastructure (CDRI) and the Global Biofuel Alliance (GBA), demonstrate the immense potential that arises when scientific expertise and diplomatic strategy work in tandem. Today's interlinked technological landscape calls for sustained, institutionally rooted systems that can anticipate global shifts, articulate India's developmental priorities, and build enduring coalitions across regions and disciplines. By investing in trained science diplomats to expand its overseas presence, India has the opportunity to transform its rich scientific base into strategic influence and global leadership. With the global shift towards science-driven economies, STI diplomacy is no longer a peripheral goal; it is central to shaping a secure, innovative, and equitable future for India and the world.

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Emerging Trends in India’s Digital Trade Diplomacy

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Introduction

Digital Trade is assuming greater importance in today’s technology-driven world and has become a strategic tool to gain economic leverage and secure a greater share in the global economy. The Global Digital Trade Development Report 2025, released by the International Trade Centre and the United Nations Conference on Trade and Development (UNCTAD), stated that globally, digital trade increased from \$4.59 trillion to \$7.23 trillion in 2020-2024 and grew at a rate of 12.1% in comparison to the 9.7% growth rate in the overall global trade.¹ India has not explicitly defined digital trade in its diplomatic agreements, but has included prominent agendas pertaining to digital trade, such as cross-border data flows, cooperation on digital products, paperless trade, personal data protection, e-invoices, e-signatures, customs duties on electronic transmissions, online consumer protection, access to source code, etc. Digital trade is broader in scope than e-commerce, as it encompasses not only the trading of goods and services using electronic means, but also the export of digitally enabled services, such as software, education, and cloud computing services. Moreover, digital trade has become an enabler in traditional sectors, such as agriculture, banking, and logistics, which rely on digital services like e-signatures, cross-border data transfers, and real-time shipment tracking.

Globally, digital trade had been recognised much earlier; for instance, the World Trade Organisation (WTO) adopted the Declaration on E-Commerce in 1998 to address trade-related issues related to global e-commerce.² Since then, a lot has transpired, with a gradual shift in the nature and content of the recently forged trade deals such as free trade agreements (FTAs) between various countries incorporating digital trade chapters, standalone digital trade agreements (DTAs) and digital economy agreements (DEAs) as part of diplomatic negotiations, leading to the unfolding of a more specialised digital trade diplomacy. India has recently forayed into the domain of digital trade. Interestingly, cross-border data flows have emerged as one of the most sensitive and highly contested domains in digital trade agreements, due to several factors, including provisions on data localisation in the Digital Personal Data Protection (DPDP) Act, 2023.

The State of India’s Digital Economy

The Global Digital Trade Development Report 2025 has recognised India as one of the fastest-growing digital players in the global digital economy, with an average annual growth rate of 16.9% and the third-largest exporter of digital services, which include software, education, data processing, finance, etc.³ India’s digital economy accounted for nearly 11.74% of the GDP in 2022-23 and is expected to contribute one-fifth of the

national income by 2029, which is larger than the agricultural and manufacturing sectors.⁴ Moreover, a dedicated division, the Investment and Digital Economy Division in the Department of Economic Affairs, Ministry of Finance, specifically handles policy matters and global partnerships related to India's digital economy. A report titled "Click, Shop, Repeat" by Bessemer Venture Partners has suggested that India's digital economy will cross the 1 trillion threshold by 2030 and has attributed it to factors like rising e-commerce, online financial transactions, and increasing smartphone usage.⁵ With strong projections backing the growth of India's digital economy, digital trade has become more prominent than ever in India's global trade negotiations.

Impact of Digitalisation on Traditional Sectors

Digitalisation is restructuring traditional sectors in the Indian economy to enhance efficiency, productivity, and revenue. For instance, the agriculture sector is employing digital agri-commerce and agri-fintech to streamline processes, and the manufacturing sector is emerging as an exporter of electronic goods for ICT-enabled services. Sectors like retail, education, healthcare, and banking are also providing services through online platforms. There are concerns that smaller firms are struggling to fully operationalise their trade and services in a digital ecosystem; however, in the long run, India could emerge as an exporter of technology solutions, especially for emerging economies looking to modernise their traditional sectors.

Emerging Global Patterns in Digital Trade Diplomacy

Globally, digital trade has become an important agenda item in diplomatic negotiations. The EU's global engagement has largely been value-based, seeking to oppose unjustified barriers to digital trade while ensuring that privacy and data protection measures remain uncompromised. Interestingly, in 2023, the US adopted a pro-regulation stance by withdrawing its support from the Joint Statement Initiative on Electronic Commerce, which supports liberal trade rules.⁶ The absence of globally agreed rules has therefore caused a shift from multilateral to regional and bilateral engagements in digital trade diplomacy. India has negotiated digital trade agreements with Singapore, the United Arab Emirates (UAE), and the UK, and is further diversifying its engagement by bilaterally negotiating with countries such as Chile, Peru, Qatar, and Bahrain.⁷ Moreover, digital cooperation has been a significant component in India-Africa ties as well.⁸

India's Recent Digital Trade Agreements

The India-Singapore Comprehensive Economic Cooperation Agreement (CECA) is one of the earliest FTAs related to digital trade, signed in 2005, that recognises the economic potential of e-commerce and defines key terminologies like digital products and electronic transmissions, and includes non-discriminatory provisions on digital products and a moratorium on customs duties on electronic transmissions.⁹ In 2022, India signed a more comprehensive agreement with the UAE, which includes a dedicated chapter on digital trade, the first of its kind for India. The India-UAE Comprehensive Economic Partnership Agreement (CEPA) is also the first FTA signed by India that includes provisions on cross-border flow of information.¹⁰ Interestingly, it also includes provisions on digital government and cooperation on digital products that aim to foster a more efficient e-governance for citizens, promote digital inclusion, and bridge the digital divide.¹¹

The most recent digital trade agreement, i.e., the India-United Kingdom Comprehensive Economic and Trade Agreement, signed in July 2025, includes binding commitments in comparison to the India-UAE CEPA.¹² India is simultaneously engaging with the EU to forge a bilateral FTA on trade and investments. India is currently showing the strongest potential in the export of its digital public infrastructure called IndiaStack, where it has signed MoUs with countries like Armenia, Antigua & Barbuda, and Sierra Leone, to share IndiaStack, and a few other countries are expressing interest.¹³ Moreover, countries like France, Singapore, UAE, Qatar, etc. have already embraced the Indian Unified Payments System (UPI), making the Indian digital payments system global.¹⁴ India is now working towards positioning itself as a global leader in digital payments by pushing for the adoption of UPI within the BRICS bloc.¹⁵

Evolving Principles on Digital Trade in India

While India's older FTAs largely focused on trade in physical goods, some of the recently forged FTAs have varied levels of commitments on digital trade, with India's digital public goods, like IndiaStack, emerging as a prominent arena for cooperation. Moreover, India's domestic data protection and data regulatory architecture is still evolving, thereby making its approach towards global trade deals more cautious. While India has traditionally opposed WTO provisions on e-commerce, especially those imposing a moratorium on customs duties on digital goods and services, by alleging that they favour developed countries and cause revenue loss for large markets like India, it has softened its hardline stance in recent years.

India's digital trade diplomacy has come a long way from opting out of the Regional Comprehensive Economic Partnership (RCEP), one of the largest FTAs between the ten ASEAN member countries and its FTA partners like Australia, China, New Zealand, Japan etc. in 2019 due to reservations regarding the e-commerce chapter that would potentially compromise its domestic data regulatory space¹⁶ and refusing to sign the Osaka Declaration advocating Data Free Flow with Trust (DFFT) at the G20 in 2019¹⁷ to softening its own data localisation policy in the recently enacted Digital Personal Data Protection (DPDP) Act, 2023.¹⁸ The Central Government has notified the rules for the DPDP Act, 2023 in November 2025 and paved the way for a functioning law that deals cross border data flows in India.¹⁹ Moreover, there is a shift in the degree of commitments agreed upon in the digital trade agreements. For instance, the India-UAE digital trade commitments are not binding but instead based on cooperation to facilitate digital trade. In contrast, the India-UK FTA contains more binding commitments, especially those on preventing mandatory access to source codes, which India has previously refused to concede.²⁰

Emerging Position on Digital Trade Diplomacy

India's stance on digital trade diplomacy appears to be about expanding digital trade by leveraging its position as one of the largest exporters of digitally deliverable services without compromising its domestic regulatory space. Nevertheless, India's legislation in domains like telecommunications, consumer protection, and data protection is likely to influence digital trade policies at the diplomatic level.²¹ Digital trade has the potential to strategically secure India's economic interests through digital trade diplomacy, particularly as geopolitical fault lines widen amid shifting power dynamics in global politics. However, as India sheds its hesitations on forging deeper digital trade commitments, subsequent FTAs, especially the forthcoming one with the EU, are expected to set a benchmark for India's future negotiations and digital trade policy preferences.

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Traditional Medicine: A New Era of Health Diplomacy

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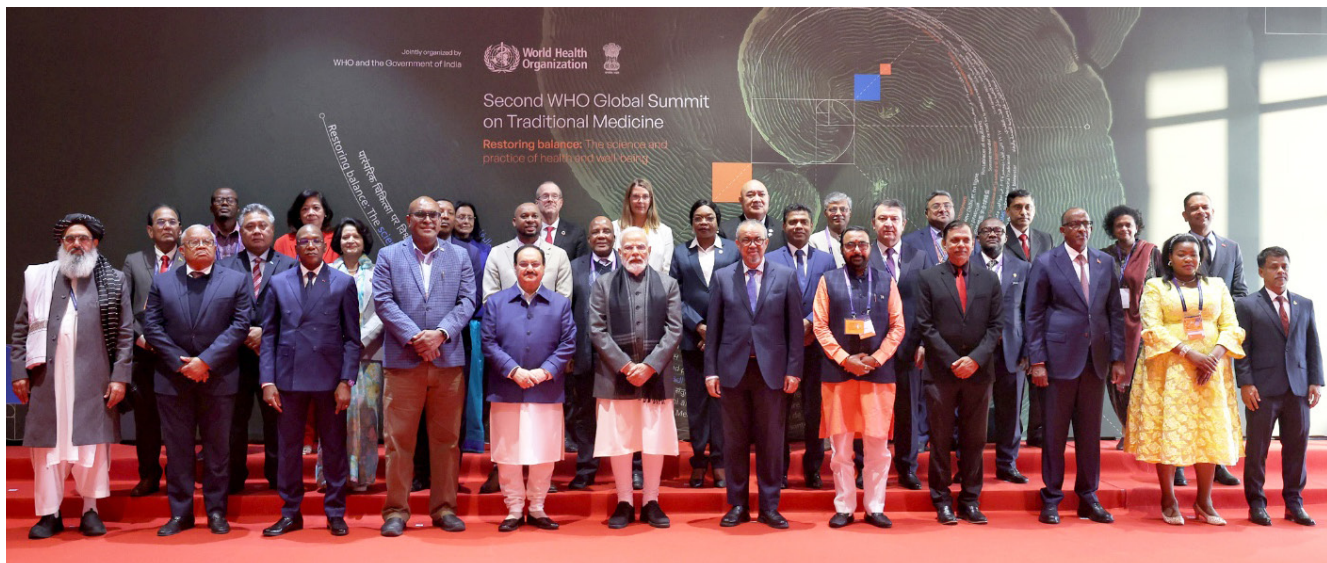
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The Second WHO Global Summit on Traditional Medicine, held in New Delhi in December 2025, marked a new frontier in global health governance. Jointly organised by the World Health Organisation (WHO) and the Ministry of Ayush, Government of India, the summit provided a timely diplomatic platform to advance a shared vision of inclusive and sustainable health. As the *Atharva Veda* mandates, '*Ayushyamanam shariram, shantim prapnuyat*', that is, 'may the living body attain health and peace', highlighting the inseparable link between human well-being and societal harmony.

Diplomacy and Global Health Governance

The summit reaffirmed the understanding that diplomacy in traditional medicine serves as a vehicle for health equity and peaceful coexistence. By integrating diverse healing systems into global frameworks, nations can foster mutual trust and knowledge exchange, supporting the principles of inclusivity and



Indian Prime Minister Narendra Modi and WHO Director-General Dr Tedros Adhanom Gebreyesus during the closing ceremony of the summit. Photo credit: PIB India 2025

shared responsibility that reinforce international law. Dr Shyama Kuruvilla, Director, WHO Global Traditional Medicine Centre, emphasised that traditional medicine makes a meaningful contribution to universal health coverage when its integration is evidence-informed, ethical, and respects cultural and ecological foundations. The summit was a vital gathering where the diverse needs and goals of both developing nations, i.e., the Global South, and wealthier, industrialised nations (the Global North) were discussed and balanced. The dialogue centred on the principle of equity, and India acted as a bridge between these two hemispheres. In this context, the *WHO Global Traditional Medicine Strategy 2025–2034* underscores health equity as the guiding principle of this emerging global framework.

Environment, Biodiversity, and Legal Frameworks

Deliberations during the three-day global summit established that traditional medicine systems depend on biodiversity and healthy ecosystems. Consequently, diplomatic and policy frameworks should incorporate environmental law principles such as sustainable resource use, biodiversity conservation, and climate resilience. Protecting medicinal plants and ecosystems is both an environmental obligation and a public health priority. Hence, legal instruments can promote equitable benefit-sharing and support the rights of Indigenous and local communities, in line with international human rights norms. The summit's focus on inclusivity echoes the work of Nobel laureate Amartya Sen (*The Idea of Justice*, 2009), who argues that justice in health depends on respecting a plurality of perspectives and local knowledge, rather than relying exclusively on uniform technical frameworks. This can also support intergenerational equity and long-term peace.

A key highlight of the summit was the recognition that traditional medicine is inextricably linked to environmental integrity. The New Delhi summit stressed that human health cannot be protected without safeguarding the ecosystems that provide medicinal flora. To this end, the summit attained several key objectives, including:

- **Regulatory Landmarks:** The advancement of digital tools, such as the Traditional Medicine Global Library (TMGL), to provide a digital public infrastructure for tracking and verifying ancient knowledge. This ensures transparency and provides a robust defence against misappropriation.
- **Indigenous Rights:** Deliberations focused on ensuring that the Global North adheres to international norms regarding equitable benefit-sharing. This is crucial for the communities of the Global South who have preserved these traditions for millennia.
- **Policy Integration:** The summit established that effective governance now demands cross-sectoral integration across health, environment, trade, and intellectual property rights (IPR).

Peace, Equity, and Cultural Respect

During the sessions, delegates also highlighted that formal recognition of traditional medicine within health governance frameworks is vital for supporting social inclusion and cultural dignity. From a diplomatic perspective, the discussions stressed how such recognition can act as a catalyst to reduce health disparities, strengthen community resilience, and contribute to lasting social peace. A significant point of consensus was that traditional healing systems, ranging from Ayurveda in the East to Indigenous North American medicine in the West, share a foundational emphasis on harmony among individuals, communities, and nature. It was concluded that these holistic values align perfectly with the goals of preventive diplomacy and the United Nations Sustainable Development Goals (SDGs). By validating these diverse systems, the summit affirmed that global health policy can foster a more respectful and resilient world order.

The summit's technical dialogues revealed a thoughtful synergy between global traditions. Experts mentioned that legal frameworks are not just administrative tools, but also a means to ensure cultural dignity. For instance, the Indigenous North American philosophy, '*Health is harmony with all our relations*,' was discussed alongside the Ayurvedic sciences of Dinacharya and Ritucharya. Together, these systems illustrated that health is inseparable from ecological balance as well.

During a technical session, the legacy of the late Gandhian and legal activist Ela Bhatt was also recalled; she once said that *'When people's knowledge is respected, and their rights protected, peace and progress follow.'* The delegates acknowledged that the formal recognition and protection of traditional medicine does more than provide healthcare and help heal historical injustices.

Strategic Recommendations

The summit's deliberations culminated in a set of strategic imperatives aimed at ensuring traditional medicine makes a meaningful contribution to global health. The following priorities were raised and adopted as essential pillars for the time to come:

- **Multilateral Dialogue:** Delegates emphasised the need to strengthen cooperation through WHO-led platforms to foster mutual trust and bridge the gap between diverse health systems.
- **Regulatory Harmony:** The discussions advocated for national legal frameworks that strike a balance between safety and quality, while promoting innovation. The *Ayush Mark* was highlighted as a successful model for ensuring standardisation while supporting the growth of traditional medicine sectors.
- **Environmental Integrity:** A key consensus was reached to embed conservation and climate resilience directly into health governance, thereby protecting the ecological foundations upon which these medicinal systems depend.

A New Paradigm for Governance

The sessions of the 2nd Global Summit on Traditional Medicine further established that environmental and biodiversity protections are no longer peripheral, but must be included as a core component of traditional medicine governance. Moreover, there was a strong call to safeguard indigenous and traditional knowledge through ethical, rights-based legal instruments that prevent exploitation.

The summit concluded that traditional medicine cooperation should be utilised as a strategic tool for *'health diplomacy'*, peacebuilding, and sustainable development, fostering a more resilient and equitable global order.

Toward a 'Sanatan' Future

In his concluding address at the closing ceremony, Prime Minister Narendra Modi reaffirmed India's commitment to a science-based, people-centred approach to traditional medicine.

While much work remains to bridge the gaps in research and funding, this summit provided a solid foundation on which to build by uniting ancient wisdom with modern law, paving the way toward a *'Sanatan'* (perennial) future that ensures collective well-being for both people and the planet.

MoUs Signed //

Kalmyk State University and Nalanda University Sign Memorandum of Cooperation to Strengthen Educational and Cultural Ties

In a significant move to strengthen educational, scientific, and cultural ties between India and Russia, Kalmyk State University, Elista, signed a Memorandum of Cooperation with Nalanda University, India—one of the world’s oldest centres of learning. The agreement marks a new phase in bilateral academic engagement and was formalised during a high-level meeting held at Kalmyk State University, attended by representatives from diplomatic, academic, and regional institutions of

both countries. The partnership underscores the shared commitment to advancing international cooperation in higher education, research, and cultural exchange. Discussions outlined a broad agenda for collaboration, including academic exchanges, joint research projects on traditional medicine and social issues, the development of dual-degree programs, and collaborative cultural initiatives.

Announcements //

Stipendium Hungaricum Scholarship Programme

Submission deadline: 15 January 2026

Further information at:

<https://stipendiumhungaricum.hu/apply/>

AAAS-TWAS Course on Science Diplomacy

Submission deadline: 29 January 2026

Further information at:

<https://twas.org/opportunity/aaas-twas-course-science-diplomacy>

JSPS International Fellowships for Research in Japan

Submission deadline: 28 April 2026

Further information at:

https://www.jsps.go.jp/file/storage/j-fellow/j-fellow_14/application_requirements/2026/2026_applicationguideline_e.pdf

New Publications //

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Forthcoming Events

Johns Hopkins Science Diplomacy Summit

Date: April 13-14, 2026

Further information at:

<https://washingtondc.jhu.edu/events/series-forums/johns-hopkins-science-diplomacy-summit/>

Imagining New Ground for Science Diplomacy

Date: June 16-17, 2026

Further information at:

<https://genevanations.ch/upcoming-conference/>