Competing in a Science-Driven World: Time to Scale-up Indian Science Diplomacy[i]

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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

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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) programme[5], ISRO-enabled technologies[6], 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 2023[8], 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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