Leveraging Science Diplomacy for High Priority and High Opportunity Areas

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International dynamics of the 21st century are increasingly driven by a nation's scientific, technological and innovation prowess, which significantly shapes economic and social growth, market dynamics and access, self-reliance, and security quotient. More importantly, it directly influences the stature of a country in the high table of nations.

For India, Science, Technology and Innovation (STI) are now recognised as drivers and pillars of growth across sectors covering agriculture, communication, clean energy, climate resilience, defence, disaster management, education, health, manufacturing, transport, water, etc. As India transitions to being one of the top global economies, the role of S&T will be profound and prolific, touching the lives of its people and polity. The span of S&T policy interventions, both in its breadth and depth, has become increasingly important in addressing national needs and aspirations by being inclusive, and at the same time meeting international obligations as a responsible state actor in the comity of nations.

India's efforts towards integrating STI to achieve a national development agenda have been imbibed in many of its current national missions and programs. Unlike in the past, these missions are based on scientific knowledge convergence by employing smart technology platforms for efficient last-mile delivery and service access.

India today has a thriving and vibrant innovation ecosystem, with the third-largest start-up enterprise globally and perceptible growth of science-led deep-tech start-ups. Emerging areas of cyber-physical systems like AI, ML, analytics, IoT, deep learning, quantum, cybernetics, semiconductor research, 5G/6G communication, defence tech, clean energy, health tech, aerospace and outer space technology, along with new frontiers of bio-engineering & bio-manufacturing has provided enabling platforms for creating new knowledge and developing indigenous products, patents, and services that have market potential domestically but more significantly also at a global level.

The Product Linked Incentive (PLI) schemes of the government, with an outlay of approximately ₹ 1.97 lakh crores, aim to ensure high-end indigenous manufacturing backed by technology-led innovations in solar photovoltaic modules, green hydrogen, semiconductors, advanced battery technology, automobiles, bio-medical devices, pharma, drones, telecom, technical textiles, etc. It will not only help import substitution but also enable India to play a crucial role in the global supply chain management in critical areas such as energy, digital, defence and health security. In many frontier areas of R&D, India currently has a level playing

field with respect to other advanced countries, thus providing an opportunity for us to compete in the world market.

India has already demonstrated the power of digital public infrastructure in promoting welfare objectives, from financial inclusion to vaccine delivery. It has been amply showcased and recognised how S&T-led innovation played a critical role in fighting COVID and meeting the multifaceted challenges posed by the pandemic. The '*Vaccine Maitri*' initiative scripted a new paradigm in health diplomacy, leveraging seamless partnerships and collaborations at sub-national, national and international levels.

Clearly, using S&T as a potent tool for diplomacy is becoming increasingly significant now than ever in our foreign policy enunciation. Addressing the 2022 Global Technology Summit, External Affairs Minister Dr S Jaishankar acknowledged that the rise of India is deeply linked with the rise of Indian technology. He alluded to the central role that technology will play in shaping our future relationships with countries worldwide. In future, India's engagements will be increasingly scripted based on technology sharing and transfer, including supply chain and market access in all critical sectors.

This profound statement was further solidified by the historic June 2023 Indo-US Summit declaration captioned 'Charting Technology Partnership for Future'. This declaration highlighted the cardinal role of scientific and technological collaboration in defining and deepening our strategic partnership with the United States. The Initiative of Critical and Emerging Technology (ICET) announcement was a watershed moment in diplomatic parlance based on the tacit prowess of collaboration in emerging and frontier domains of S&T. It will enable engagement and partnership across the entire spectrum of non-strategic (soft) to strategic (hard) sectors based on mutual strength, capabilities and needs. Technology has become the central focus of India's bilateral engagement not only with the USA but also with countries like Australia, France, Germany, Israel, Japan, Singapore, South Korea, Sweden, the UK and the EU.

This can be truly described as leveraging science diplomacy for high-priority and high-opportunity areas founded on principles of co-development, co-investment and co-production, leading to technology transfer aimed towards ushering in high-tech commerce. It marks a departure from the old regime of technology sanctions and denials. It is also a nuanced acknowledgement of India's scientific, technological and intellectual capabilities.

In future, the key to success will remain in 'building partnerships on a win-win model' based on shared values of co-creation, co-development and co-deployment. India's mantra should be conducting joint research projects in frontier domains, cross-border open innovation, and effective use of technology facilitation mechanisms in high-opportunity and high-priority areas of our national interest and needs, including market access.

Going ahead, India's cross-border engagement in STI should be strategically driven to accrue value-add to our national priorities and needs. Gaining global competitiveness and visibility through collaboration and connecting Indian research with international efforts to address global challenges should be one of the key objectives. New knowledge creation through scientific cooperation to mitigate technology gaps and promote techno-economical gains should be proactively pursued, particularly when engaging with developed countries. This will be a 'give and take' relationship driven by leveraging each other's complementary strengths, infrastructure and resources.

At the geopolitical level, using the soft power of S&T to build trustworthy relationships should be imperative for directed foreign policy. A chosen path should be to engage with developing countries by investing in need-based infrastructure to address local problems and promote human capital development. This engagement is anchored on the principles of 'giving is gaining' with the objective to build people-to-people connect. Our 'Act East' and 'Neighbours First' policies, including South-South cooperation focussing on Africa, should adopt this engagement model proactively. India can play a role model by extending its S&T capabilities to provide technological solutions and build human capacity for deserving and desiring countries with which we seek to develop long-standing relationships.

The third pillar of S&T diplomacy should be to promote technology-led innovation by forming alliances with highly innovative countries. It can be best leveraged through collaborations that enable innovation and techno-entrepreneurship, leading to cost-optimised smart products and processes that penetrate both developed and developing markets. Internationally, we must collectively portray India as an emerging S&T powerhouse, effectively leveraging its technology-led innovation skills and trained workforce to provide solutions to various challenges in an affordable, accessible and available manner.

Technology denial or prohibitive cost of technology, especially under climate change and clean energy negotiations, and prevailing WTO patent regime are some practical challenges that could hinder equitable and inclusive technology facilitation mechanisms. Our S&T community and the diplomatic fraternity should collectively highlight and defend the country's position and interests to ensure a level playing field while addressing pressing global challenges and meeting the Sustainable Development Goals (SDGs) we are committed to as a nation. India can play a leadership role by providing the STI roadmap and tools for achieving the SDGs in developing countries, leading to impactful and visible contributions by our country.

As STI increasingly becomes an intrinsic diplomatic tool in India's foreign policy enunciation, it will require the engagement of non-government actors such as the private sector, academia and research community, the Indian diaspora, and the media. Structured communication is about developing and delivering strategic national aims by understanding and influencing world opinion. Often, the Indian commentary on scientific and technological advancements is tactical, responsive and fragmented. Managing risk and reputation through a cogent media narrative is vital when discussing S&T and diplomacy.

This requires proactive and dynamic engagement of the scientific and technological community with other stakeholders, including the diplomatic fraternity and other knowledge enterprises, including media, to appreciate, design and develop effective international engagement tools through STI to meet both the national needs and global challenges that India will face in a closely connected and shrinking world.

To conclude, international collaborations in STI are a necessity today. No nation alone has the capacity, infrastructure and human resources to address the humungous challenges that the earth as a planet and mankind as a progenitor faces for its existence. It is inevitable, therefore, that STI will increasingly become an intrinsic and chosen diplomatic tool in India's foreign policy during the Amrit Kaal.