Science Diplomacy - A New Chapter in IISF2020

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The introduction of the 'Science Diplomacy' event at the 6th edition of the India International Science Festival (IISF) 2020 aimed to spread awareness and sensitise governance and policymakers to accept the concept of science and technology in diplomacy and give its due importance to nation-building. The event was held online during 22-25 December 2020 and was successfully coordinated by the Department of Science and Technology (DST), CSIR-National Institute of Science Communication and Information Resources (CSIR-NISCAIR) and Vijnana Bharati (VIBHA). The event provided a platform for young men and women to understand the nuances involved in this relatively new subject which has already made benchmark progress in a series of India's scientific successes. A huge step towards 'Aatmanirbhar Bharat', 'Make in India', 'Digital India', 'Startup India', and other national programs which depend on the synergy of scientists, policymakers, academicians, policy analysts, industrialists, economists, diplomats and technocrats.

In the 21st century, the role of science, technology, and innovation (STI) has become a fundamental tool to balance the social, economic, technological, and financial resources of any nation. There are many international issues like climate change, extreme weather, deforestation, health, and pandemic that need the attention and trust of multi-stakeholders at the local as well as the global level. There is a growing need for strengthened international partnerships on STI to be able to address the common issues and achieve the objectives of Sustainable Development Goals (SDGs). India has committed to share its experience in the field of STI with neighbouring countries through existing capacity-building programs and transferring its affordable technologies to address the socio-economic needs of its neighbours. Recently, the announcement of $10 million towards a COVID-19 emergency fund and distribution of COVID-19 vaccine under '*Vaccine Maitri*' (*Maitri* is Hindi for friendship) by Hon'ble Prime Minister of India, Narendra Modi has been the current examples of how science diplomacy can be used for global welfare, which was incidentally the theme of IISF2020. Going forward, Science & Technology will be instrumental in setting trade and economic agenda, and Science diplomacy will be an indispensable part of all multilateral and bilateral diplomatic engagements.

During this event, the sessions were divided into three sub-themes: *'Science Diplomacy for Aatmanirbhar Bharat'; 'Setting Science Agenda for Diplomacy during India's Presidency of G20, BRICS & SCO'*; and *'Science for Diplomacy and Diplomacy for Science'*. A total of fifteen eminent policymakers, diplomats, researchers, academics, and industrial leaders attended as panellists, and hundreds of students, researchers, academics participated in all three sessions. Speakers provided their views on the role of science diplomacy concerning economic growth, industrial research & trades, diplomatic relations, mega-science projects and gender

equality. Apart from eminent speakers, Hon'ble Union Minister for Science and Technology, Earth Sciences and Health and Family Welfare, Dr Harsh Vardhan; India's G20 Sherpa, Mr Suresh Prabhu; and Secretary, DST, Prof. Ashutosh Sharma also addressed the gathering and highlighted the importance of science diplomacy for fostering national goals and enrich India's image at the global level.

This cover article contains extended versions of talks of four eminent speakers from different sessions of the event. These articles provide an overview of the evolution of science diplomacy and the significance of the integration of science and technology cooperation in international relations with the perspectives of diplomat, researcher, academia, and industrialist. The event also ran an Essay Writing Competition on the topic '*Necessity for Science Diplomacy'.* This issue contains a few selected essay entries as well (p. 24—35).

Taken together, this set of articles meaningfully contributes to different perspectives of science diplomacy and deepen our understanding of the multifaceted ways that we might strengthen our cooperation in the context of diplomatic relations through the intervention of science and technology.



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Science Diplomacy for Mega-science Projects

The first particle accelerators were invented in the 1930s to provide energetic particles to investigate the atomic nucleus structure. Since then, they have been used to explore many aspects of particle physics. Before the 1930s, there were a series of projects investigating how accelerators could be developed. However, it was not until 1930, inspired by Norwegian engineer Rolf Widerøe, that 27-year-old physicist Ernest Lawrence created the first circular particle accelerator at the University of California, Berkeley, with graduate student M. Stanley Livingston. How ideas developed by a Norwegian engineer came to life in Berkeley are tied to the impact of science diplomacy in the advancements of research and development worldwide.

SciTech DiploHub writes that science diplomacy, innovation diplomacy, techplomacy, STI diplomacy and SciTech diplomacy are all different ways of referring to the same thing: the use of scientific, technological, and academic collaborations among countries, regions, and societies to address common issues and to build sound international partnerships. Experts use various definitions for this concept; nevertheless, science diplomacy has become an umbrella term that includes several kinds of research-based, scientific, academic, and engineering exchanges among nations and societies. The most extended definition, set by the Royal Society and the American Association for the Advancement of Science in 2010, refers to science diplomacy as consisting of three linked strands: Science in Diplomacy: where scientific know-how and evidence is used to inform and support foreign policy objectives; Diplomacy for Science: where diplomatic efforts and resources are aimed at facilitating international scientific and technical cooperation; and Science for Diplomacy: where scientific cooperation is used as a source of soft power to strengthen or foster foreign relations.

Science diplomacy is not new, but it is more important than ever due to the scientific dimension of the current global challenges. No nation-state can tackle any of these challenges alone, thus their foreign policy needs to integrate new tools for a world of increasing scientific and technical complexity. Stemming from this allusion from SciTech DiploHub, it is, therefore, necessary to explore the importance of science diplomacy.

Why Science Diplomacy is Important

When the US Secretary of State John Kerry was about to negotiate a nuclear deal with Iranian diplomats in 2015, the physicist, Ernest Moniz, US Secretary of Energy was beside him; his presence signifying the growing interconnectedness between international diplomacy and science.

Unlike in the 19th century, when world peace depended on who had the most force, the future of global peace hinges on the level of diplomatic relations between countries, and how scientific advancements are now tied with cross-border knowledge sharing. This was why, unlike in the past, when each country and its scientists guarded their knowledge fiercely and only opened it to allies, the development of the particle accelerator saw multilateral knowledge sharing leading to the advancement of physics in ways which the world had never known. It opened the world of science to mega-science without borders.

Understanding Mega-Science

Historians Lillian Hoddeson, Catherine Westfall, and Adrienne Kolb introduced the term 'Mega-science' to characterize experiments that are of an unprecedented scale in terms of equipment, experimental groups, and budgets; and that involves 'strings'. By strings, the authors were not referring to the controversial 'string theory'; they meant that the experiments are not staged once and then disappear but continue to have an evolving presence in an experimental program (a 'string' of experiments), and sometimes even no clear-cut end. The experiment, so to speak, becomes a long-term fixture of the institutional stage itself.

The operational dimension of mega-science means that it is not just a partnership between two scientists but also multiple researchers across different locations. The multifaceted level of knowledge sharing also implies an openness between governments to encourage multilateral developments. While the growth and advancement of mega-science have been sporadic across several continents, an economical visit to the importance of physics-based mega-science is essential.

Mega-Science and Science Diplomacy for Global Development

While there are several examples, a very crucial example is the declaration of the Antarctic Treaty. The Antarctic Treaty is a development of science diplomacy, which has merged with mega-science. In the 1950s, scientists working on developing mega-science projects saw the potential hazard of ignoring the Antarctica continent. Although inhabited, scientists were worried that in the future, it may become the home to newly discovered resources, or may be used as testing sites for nuclear energy projects. To prevent a future escalation of conflicts, diplomatic scientists pressured governments to consider a treaty that would prevent any such conflicts in the future.

According to the US Department of State, fortunately, international scientific associations were able to work out arrangements for effective cooperation. In 1956 and 1957, American meteorologists 'wintered over' at the Soviet post Mirny, while Soviet meteorologists 'wintered over' at Little America. These cooperative activities culminated in the International Geophysical Year of 1957-1958 (IGY), a joint scientific effort by 12 nations - Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, the United Kingdom, and the United States - to conduct studies of the Earth and its cosmic environment.

The AAAS Centre for Science Diplomacy also informs that scientific research and innovation are among the most potent forces driving economic development and social change. While advanced scientific research facilities are becoming larger and more complex which require more resources, funding for scientific research is often not increasing in many countries during the timescale of these projects. Faced with these

intimidating technical and financial challenges, science can either abandon its exploratory spirit or adapt by fostering greater coordination and collaboration on a global scale.

The need for governments to put attention to mega-science and science diplomacy has been well-exemplified in Europe. In 2019, the Centre for Economics and Business Research (CEBR) carried out an analysis to measure physics's impact on the modern economy. CEBR discovered that physics makes a net contribution to the European economy of at least €1.45 trillion per year and suggests that physics-based sectors are more resilient than the broader economy. By analysing data available in the public domain, CEBR found out that between 2011-2016 in 28 European countries, physics-based goods and services contributed an average of 44% of all exports. According to CEBR, the top industries are shared as follows: Germany 29%, the UK 14.2%, France 12.9% and Italy 10.4%. An important take away from this report is that European countries invest at least €22 billion every year to keep this going. Some of these fundings come from governments. And this once again proves the importance of science diplomacy.

Mega-Science and Science Diplomacy: What happens at CERN

The European Organization for Nuclear Research (CERN) is one of the world's largest and most respected centers for scientific research and research organization. CERN operates the largest particle physics laboratory in the world. Physicists and engineers at CERN use the world's largest and most complex scientific instruments to study the basic constituents of matter – fundamental particles. Subatomic particles are made to collide together at close to the speed of light. The process gives us clues about how the particles interact and provides insights into the fundamental laws of nature. We want to advance the boundaries of human knowledge by delving into the smallest building blocks of our universe.

AAAS Centre for diplomacy notes that while activities that can be considered science diplomacy have a long tradition in Europe, the concept itself and the discussion about its benefits had gained traction during the last decade when diplomatic services in Europe started to use the term explicitly. However, understanding what constitutes science diplomacy and how it can best be used differs substantially between foreign ministries and services across Europe. Only a few countries have published explicit science diplomacy strategies.

CERN is a recognized example of peaceful international collaboration based on transparency, openness and inclusion. The invention of the World Wide Web is emblematic of the spirit that drives advances in basic science, which enable open innovation and education and connect the worldwide community through shared values. A typical scientific community is self-organized and able to share the infrastructure needed by all. The centrality of knowledge (scientific arguments in the global policy), long-term thinking, agile project and risk management, even under harsh conditions of unpredictability, smart governance and social networking, big data, considering alternative scenarios – these are all features and "goods" that belong to the scientific world, but that also play a role in different contexts.

CERN has, therefore, proven that the future of mega-sciences is not just in national laboratories but in collaborative research institutions. Like CERN, other institutions employ similar collaborative approaches for mega-science projects. FAIR, the Facility for Antiproton and Ion Research in Europe, is one of the largest research projects worldwide. FAIR is being built in Darmstadt, Germany. At FAIR, the matter that usually only exists in the depth of space will be produced in a lab for research. Scientists from all over the world will gain new insights into the structure of matter and the evolution of the universe from the Big Bang to the present. FAIR is under construction at GSI Helmholtzzentrum für Schwerionenforschung. Its existing accelerator facilities will become part of FAIR and will serve as the first acceleration stage. For the realisation of FAIR, accelerator experts, scientists, and engineers of FAIR and GSI are working closely together in teams worldwide.

Like FAIR, ITER is building one of the most important mega-sciences projects that are also based on science diplomacy. In southern France, 35 nations are collaborating to build the world's largest tokamak, a magnetic fusion device that has been designed to prove the feasibility of fusion as a large-scale and carbon-free source of energy based on the same principle that powers the Sun and stars. The experimental campaign that will be carried out at ITER is crucial to advancing fusion science and preparing the way for the fusion power plants of tomorrow. ITER will be the first fusion device to produce net energy, maintain fusion for long periods, and to test the integrated technologies, materials and physics regimes necessary for commercial production. Thousands of engineers and scientists have contributed to the design of ITER since the idea for an international joint experiment in fusion was first launched in 1985. The ITER members — China, the European Union, India, Japan, Korea, Russia and the United States — are now engaged in a 35-year collaboration to build and operate the ITER experimental device, and bring fusion to the point where a demonstration fusion reactor can be designed.

Like CERN, FAIR and ITER, other important projects are the US's Fermilab, LIGO, SKA, and the TMT observatory.

India in the Middle of Mega-Sciences and Science Collaboration

Unbeknownst in some quarters, India is collaborating across the world to execute mega-science projects. India is currently collaborating with CERN, Fermilab and on some other critical mega-science projects. India understands what the future of development needs and India takes a front seat in these participations.

To wit, India launched a multi-city travelling mega-science exhibition - Vigyan Samagam. By the end of January 2020, seven mega-projects were exhibited that India has been and will be collaborating. The projects are Large Hadron Collider (LHC) at CERN; Facility for Antiproton and Ion Research (FAIR); India-based Neutrino Observatory (INO); International Thermonuclear Experimental Reactor (ITER); Laser Interferometer Gravitational-Wave Observatory (LIGO); Thirty Meter Telescope (TMT) and Square Kilometre Array (SKA).

It is noteworthy that India's Prime Minister Modi intends to build a $5 trillion economy by 2024-2025. While the plan covers several industries, there is an urgency and importance to the role of physics and mega-science that contributes to 12-17 % of EU industry output. It is fascinating and important, not just as a fashion statement but because India is long due to immerse itself in mega-science wholly.

Mega-sciences is not only dependent on collaboration but also on sustainability. As India collaborates with top scientists to develop technological spinoffs with far-reaching impact both on society and the economy, it is also vital that organizations like the LifeLab Foundation are supported to help groom India's next global collaborators. LifeLab Foundation has, for instance, reached over 25,000 participants in over 150 schools across the country, providing outreach, scholarships and creating innovative curriculum consolidation. As I like to say, physics is a vehicle, and we must keep driving it to pick up and drop off as many passengers as we can. All of this starts today.

Conclusively, the development of physics and mega-science through science diplomacy at an international level will foster global peace and encourage economic advancements. Therefore, governments need to enforce necessary science diplomacy-focused plans, not just for their self-interests but also for global peace. This development has become very necessary and will continue to become important if the world continues to seek sustainable science solutions. Governments that, however, decide to hoard information and prevent collaboration will suffer from their isolation. Global peace will no longer be dependent on might but cooperation. And this collaboration will be led by science and scientists.

Science Diplomacy: Perspectives from the Private sector



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The year 2020 has catalysed the adoption of new technologies and greater scientific discussion in daily life. Work from home and more informed everyday public-discussions based on scientific facts of the current pandemic are examples of this. Going forward, the digital economy will be the core of the economy- here and now- not just a niche for potential in the distant future. For the rest of the world, as much as for India, cooperation on innovation will determine the efficacy of response to our biggest challenges - economic growth and employment, climate and sustainability, resilient and robust supply chains. These challenges will need to be addressed and overcome at various levels, including G2G (Government-To-Government), B2B (Business-To-Business) and G2B.

India's success story with the India Stack - Aadhaar, Direct Benefit Transfer (DBT), Unified Payments Interface (UPI), is well recognised globally. Japan is trying to learn from India and replicate the same digital government platform. India's unmatched ability to demonstrate proof of concept and scale will remain a potent and determining factor for new and emerging scientific solutions.

Apart from Japan, Germany also has been a great partner for India in science cooperation. At the G2G and academic level, there has been great support and cooperation, both ways. The German Centre for Research and Innovation (DWIH), New Delhi, is a network of 18 German research organisations, universities, funding bodies, and research-based companies. It was established almost a decade ago by Dr Torsten Fischer of DFG, as a single stop for Indo-German collaboration. It is noteworthy, that Germany established DWIH only in five countries, India being one of them. These are a network of German organisations, universities, and research-based companies and provide a joint platform for German innovation leaders, showcase the capabilities of German research, and connect German researchers with local cooperation partners. Already, Joint citations of Indian scientists in international cooperation are amongst the highest with German colleagues, while Project funding collaboration is intense between the Department of Science and Technology (DST) and German science organisations.

Further, Indo-German Science & Technology Centre (IGSTC) was established by DST and the Federal Ministry of Education and Research (BMBF), Germany to foster innovation through Indo-German R&D networking including, industrial research partnership in PPP mode. This provides a far-sighted approach to collaborating with the private sector - both academia and industry. These platforms would serve as important frameworks for fighting the challenges of the 21st century in collaboration with friends and allies.

Coming from a background of logistics, connectivity is one of the most defining features of the 21st century. Not only physical connectivity - optical fibre cables, aviation routes, and railroads - but digital also, as the world exponentially moves towards hyper-connectivity with machines (IoT) and AI (Decision making). Satellite communication has been active for the last 50 years, but recently it saw a big boost. The coming years will witness a launch of approximately 20,000 satellites, according to Forbes and Science News (among others). This mesh of satellites will augment 5G (already more than 100M subscribers are active globally) and enable the next wave in Human and Machine connectivity and Automation through hyperconnectivity.

India has recently liberalised the space sector to private companies - and already big companies and startups alike are taking initial steps towards making India a greater space powerhouse. The new Indian

National Space Promotion and Authorisation Centre (IN-SPACe) was formed to assess the need and demand of private players, including educational and research institutions, and explore ways to accommodate these requirements in consultation with the Indian Space Research Organisation (ISRO). Applications of space technology include railways, road and bridge construction, agriculture, housing, telemedicine, disaster management, and accurate weather forecast.

India's previous experience in leapfrogging stages of technology lifecycle can again be instructive for many of our friends. For example, developed economies in Europe still have to see fiber rollout and access to broadband in rural locations but could go straight to satellite connectivity.

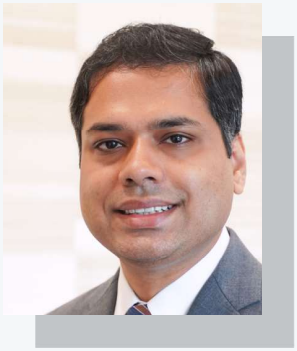
Innovations in Space communication and cost reduction (Reusable Launch vehicles) have made it feasible to compete with 5G and fiber rollouts. New satellite technologies have made satellite powerful and lighter, with low latency, massive broadband capacity, and seamless connectivity possible - and at a fraction of the cost, it used to be in the 20th century.

The private sector's entry into the Space connectivity race is changing the dynamics of the Space connectivity industry. To take just 3 examples:

- Amazon's BlueOrigin is on a mission to launch 3,236 satellite constellations for internet connectivity.
- SpaceX (Elon Musk) has launched Starlink for providing broadband communication service to remote locations, airlines, and the replacement of inter-continent fibers. Starlink constellation will have up to 12,000 satellites.
- OneWeb is bringing connectivity and broadband communication networks to communities, governments, and businesses. OneWeb recently recovered from bankruptcy and was saved by the UK government and a major investment by Bharti (Indian Telecom giant). OneWeb is looking at a constellation of 650 to 2,000 satellites.

The role of the private sector in this and other areas will continue to lead to healthy competition and cost-efficiency. It will also provide the global backbone to broadband connectivity to global enterprises, governments, sea and air travel and logistics, remote and rural access. The deployments of faster broadband will revolutionize the human and machine active connectedness.

Science Diplomacy and Indian Industry



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The significance of science diplomacy is growing and there is no iota of doubt that science diplomacy is a way of constructively engaging various nations to solve common and critical problems. For India, it will certainly be of great importance, considering our ambition as well as the potential to achieve an important position on the global stage. Is science diplomacy overlapping business diplomacy? How is the Indian industry affected by international scientific projects? Can we strengthen the Indian Industry by leveraging science diplomacy as a tool? We need to analyse further to gain more insight into these points.

Indian industry has come a long way, from the economic liberalisation in the early 90s to the beginning of industrialisation, to the growth of the Indian Information Technology (IT) industry, to the foreign trade to becoming the world's fastest-growing economy in 2014. While recently India has achieved an important position in the world, in several sectors including

pharmaceuticals, IT services, auto-manufacturing, organic chemicals, etc. There is no second thought about India's prominent role in post-COVID-19 activities. India has imminently played a critical role in working with many other nations towards the research, development as well as distribution of COVID-19 vaccines.

Indian industry has always been considered as a contender to China when it comes to becoming a hub for the manufacturing, outsourcing of global businesses, foreign investments as well as a potential of being a very large market. But if India put some of the facts together, it does have a long journey ahead to stand neck to neck with the neighbour. At this moment, this journey does not seem to be easy, as China is playing in a different league altogether. Chinese growth has been driven by some of the world's highest investment rates. This has in turn made possible both an industrial as well as an infrastructure revolution in China. When it comes to China, its industrial GDP is around 35% of the $14 trillion economies, which is nearly double India's total GDP. In 2018, China exported $2.5 trillion in goods while it imported $2.13 trillion. Roughly Chinese exports are six times Indian exports.

This is achieved by the enormous scale of manufacturing and its immense influence on several countries worldwide. Now, many countries are dependent on China for numerous critical items in various sectors. It could be engineering goods, electronics, infrastructure, or pharma and chemical. Many infrastructure projects are being executed by Chinese EPCs in various countries in Africa, Asia, and the Middle East. The "One Belt One Road programme" is a $124bn Chinese project aimed at facilitating trade and investment links between Asia, Africa, and Europe. Made in China 2025 program seeks to engineer a shift for China from being a low-end manufacturer to becoming a high-end producer of goods. Chinese investments in research have surged. Beijing created more than 900 innovation funds that collectively planned nearly $350bn of new R&D investments. Today, China seems to be ahead of US NSF in terms of funding for research. While on the other hand, it is not easy to supply products to China because China has been having compulsory certification 3C or CCC approval requirement. The process to get it as a foreign vendor is long and tedious. So, China has somehow closed its doors to its market, enabling local manufacturers to offer their products.

COVID-19 has taught many lessons. It is re-shaping the way in which countries are thinking about their strategy as well as dependency on other nations. In the beginning, there was a lot of criticism about China downplaying the virus. This has caused a backlash in many countries. This somewhat weakened position of China is a "blessing in disguise" for India. Can India attract more investment, considering this as an opportunity? China offers integrated models like land, quality & cheap labour, and sophisticated logistics. India needs first-rate infrastructure and an ecosystem to support businesses and requires more reformation in policies, basic infrastructure & easy access to power, water, labour, and internet. India has great potential and ready to showcase and promoting '*Make in India*' products. Instead of comparing with Chinese business, Indian industry may learn from countries like Germany that how to integrate science and innovation with manufacturing to achieve development and economic goals.

The creation of Aatmanirbhar Bharat is a vision of the Prime Minister and the campaign has just achieved momentum. While it also goes in line with "Make in India". But where are the realistic data to make most of the essential goods in India? Let us take examples of some of the critical technologies.

Semiconductors are required in most industries, from computers, machinery, medical devices, transportation, and countless other products. Compared to developed nations, India still does not have the manufacturing know-how of semiconductor manufacturing, design, foundry technology and largely import these items and only assemble those here. Many of such semiconductor foundries are in China, Taiwan, and Korea, where the units are advanced, and at a massive and incomparable scale. Lithium-ion batteries are also an important component for the future of the automobile and electric cars. China, Japan, the US, Korea are the largest manufacturers of lithium-ion batteries while China has been very active in sourcing lithium. China's Xinjiang TBEA Group Co Ltd holds a good amount of stake in Bolivia's state lithium company YLB. However, India's contribution is negligible and would remain at number 16 in 2025.

Indian pharmaceutical and fine chemical industries are largely dependent on Chinese imports for their raw materials. Today, over 60% of India's pharmaceutical imports are Active Pharmaceutical Ingredients (API) and intermediates, with almost 70% coming from China. The global pharma industry is around $1.3 trillion and within that, generics is around $270 billion and India accounts for 3% of the global pharma sector which is at $40 billion today. To be self-reliant in the medical device industry, there is a need to develop indigenous technological & scientific solutions. Science diplomacy may facilitate India's projection to become a $5 trillion economy by 2024 by 9-10% growth every year.

There are many small and medium-sized research companies in other countries that are ready to transfer their in-house technologies. Industry federation and organisations like the Federation of Indian Chambers of Commerce & Industry (FICCI), the Chartered Insurance Institute (CII), Engineering Export Promotion Council (EEPC), Basic Chemicals, Cosmetics & Dyes Export Promotion Council (CHEMEXCIL) etc. may facilitate industries for a process of technology transfer or procurement through Indian missions abroad. It could be licensing, technology transfer, or complete purchase. It would become a joint venture with collaboration, including government, corporates, and academic institutions.

Science diplomacy may also help in the export of made-in-India products. The role of Engineering, Procurement, and Construction (EPC) companies are critical in international trading. However, India's EPC business in Africa and the Middle East is quite lower compared to China and Korea. The creation of an appropriate ecosystem conducive to foster scientific development and innovation in the industry remains very vital. The international industrial research programs with close collaboration with the relevant industry would fasten this process. This will help to provide a common platform to the researchers, Indian entrepreneurs, industry, and government.

With the 'Vocal to Local' campaign, each country is encouraging local manufacturing and becoming independent. As countries need to address increasingly complex challenges that are some-how linked with science and technology, scientific engagement, and diplomacy between countries. Innovation, research and development, accessibility of new technologies, infrastructure development, and attraction of foreign investments remain very important goals for India to achieve. Thus, the focus on diplomacy in science shall continue to be an increasingly imminent and important matter in the years to come.



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Science Diplomacy and Gender: A Case Study of the British Council

Science diplomacy and gender have increasingly been talked about together, as issues around women, particularly inclusiveness and leadership that were discussed in the UN Conference in 1935, are discussed even now.

India stands at the rank of 112 out of 153 countries in the Global Gender Gap Rankings 2020, by the World Economic Forum. As per a UN report, India tops the world in producing female graduates in Science, Technology, Engineering, and Mathematics (STEM) but ranks 19th in employing them. It means we have good numbers of women 'studying science' where almost 40% of science undergraduates are women in India, but the gap widens for women 'doing science' in the workforce.

Only 25% of women are in science faculty positions in universities. And women make up only 14% of scientists, engineers, and technologists

employed in R&D institutions in India. The global average for the same is 28.4%. It calls the "leaky pipeline" and results in a loss of not only a talented workforce, but a huge missed opportunity in diversifying the STEM workforce which is so critical for Innovation.

Even though of the 461 awardees of the most prestigious Shanti Swarup Bhatnagar Prize for science and technology since 1958, only 15 have been women, they are the celebrated women of science, to inspire today's science graduates, especially women, to not give up either studying science or doing science, as a career choice.

The gender gap mentioned above is not only true for India but the entire world. This is the reason that supports the sharing of best practices among nations to promote and empower women in science. Therefore, gender in science diplomacy is not a matter for women per se or a policy choice, but of urgency to plug the leaky research and innovation pipeline.

Interventions through India-UK ties

The British Council's purpose is to build connections, understanding, and trust between the people of India and the UK through three core pillars: arts and culture, education, and the English language.

The council in-turn benefits by bringing the best of the UK to the world & *vice versa*! After Brexit, India continues to be a priority country for the British Council's operations worldwide. Values of mutuality, complementarity and trust are at the core of its operations in over 100 countries. Diplomats from either side often cite this fact that India and the UK share a 'Living Bridge' which is fundamentally made possible through Science, innovation and education.

As part of international science cooperation – which comes under "Diplomacy for Science", from early on, British Council recognised the significant challenges facing women to move into, and work in, Science & STEM subjects across the world. The UK also has a legislative framework in place in form of the International Development (Gender Equality) Act 2014 that makes it a legal requirement to ensure that its international programmes are gender-sensitive to be minimum and gender transformative.

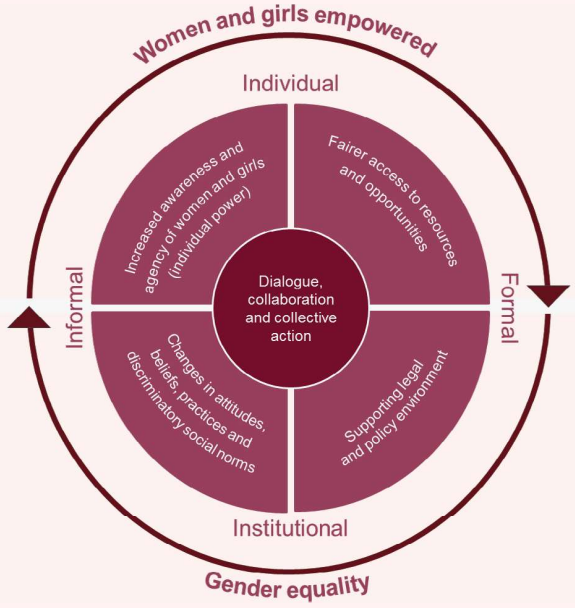


Figure 1. Theory of Change for Gender Equality (Source: British Council, 2019)

The Council has established programmes to support women and girls in STEM around the world, designed with a lifecycle approach along with interventions targeted at both individuals & at institutions. This is reflected in its theory of change framework for gender equality mentioned in Figure 1.

Individual Interventions

On individual interventions, it starts from inspiring young girls to stay in STEM, supporting women working in STEM fields, and finally working on the Institutional factors that can encourage women in academic leadership to emerge.

This is part of its Equality, Diversity, and Inclusion (EDI) strategy which sits at the heart of the British Council's work. Under the 'Education' pillar, the British Council's science work connects the UK with India through numerous programmes that have contributed to Science Diplomacy & Gender.

Starting from girls, the Council leads the English and Digital for Girls' Education programme (EDGE), which aims to improve life skills for adolescent girls in marginalised communities in South Asia. EDGE achieves this through developing English confidence, proficiency, and digital literacy, as well as social skills and awareness of rights.

In 2018, as part of the 70th anniversary in India celebrations, British Council constituted the 70th Anniversary Scholarship programme. The scholarship provided funding to young women in India to study a Master level STEM subject at a UK university. A cohort of 104 young Indian women STEM scholars studying Masters in 44 UK Universities, met with the then UK Prime Minister, Theresa May (Figure 2).

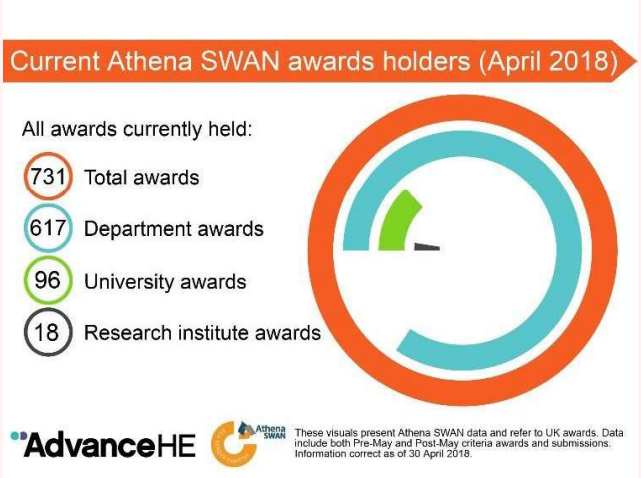


Figure 2. With then UK PM Theresa May, London

Third, the Newton Bhabha Fund delivered women in science programme in partnership with the Indian Institutes of Science Education and Research (IISER), Pune. The programme generated avenues to retain trained women workforce in science. It targeted women who are making a transition from education to scientific careers, a stage where there is maximum attrition. The programme trained 370 women scientists to continue to remain in the STEM workforce by upskilling through 3 professional avenues - science administration & management, science journalism and science policy.

Newton Bhabha Fund's flagship programmes like 'Ph.D. Placement Programme' and 'Researcher Links Workshops' with Indian Ministries – Department of Science & Technology (DST), Department of Biotechnology (DBT), Indian Council of Medical Research (ICMR), Indian Council of Social Science Research (ICSSR) – has a women participation at the rate of 44% in India which is quite encouraging.

UKIERI-Phase III, another key bilateral programme in Higher Education between the UK partners like Department of Business Energy & Industrial Strategy (BEIS); UK involved administrations and Indian partners like Ministry of Education (MoE), DST, Ministry of Skill Development & Entrepreneurship (MSDE), All India Council for Technical Education (AICTE), and University Grants Commission (UGC) has women as students (46%) and as researchers (36%) in its research and innovation partnerships between the UK and Indian universities.



Institutional Interventions

In terms of institutional interventions, globally, the British Council delivers 'FameLab', a science communication programme in over 30 countries. There is consistently higher participation of female scientists who become talented female role models to inspire other women and girls to follow a STEM career. This year the winner of FameLab International 2020 was Switzerland, won by an Indian Scholar studying there. The potential of initiating this programme by the British Council India as another bilateral one looks promising.

The second institutional intervention under Science & Gender is **Athena SWAN**, which stands for **S**cientific **W**omen's **A**cademic **N**etwork. It is a charter aimed at Higher Education Institutions in the UK to ensure women scientists progress to senior roles by removing obstacles to their advancement, equal pay, and mainstreaming support, through action at all levels. Advance HE UK is the organisation that manages this and grades institutions on silver, bronze, and gold standards as per a gender equality assessment criteria.

Athena Swan in the UK

British Council helped develop the idea with the Knowledge Involvement in Research Advancement through Nurturing (KIRAN) Division of DST to have a similar framework for the higher education and science sector in India. These discussions resulted in the co-creation of project GATI – Gender Advancement in Transforming Institutions. The Council also signed a partnership agreement with DST to implement GATI as a pilot project in India – initially for 20 institutions funded by DST and later, extending it to all 90 institutions.

As evident, fostering science diplomacy & gender outcomes are demonstrated by the design and delivery of all these programmes between India and the UK. It is made possible by the fact that the UK and India co-own, co-fund and bilaterally determine the research priorities of these programmes. Such science cooperation programmes that include gender as its shared vision and responsibility hold great promise to foster goodwill and build productive long-term international relationships between India and the UK.