INDIA'S SCIENCE DIPLOMACY

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Introduction and Concepts

- Science is the basic knowledge of nature- Technology is the practical application of such knowledge. Innovation is the adaptation of knowledge for practical purposes.
- Governance objectives – national security and quality of life for the people. To be understood in broadest sense.
- S & T has a strong impact on society and international system – its ability to give economic and military power – and its disruptive effects.
- The State must respond to S & T advances. STI policy and practice is key. Federal, State and local governments play a role.
- STI takes place in a national ecosystem with many players. This ecosystem interacts with similar ones across the world.

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S & T advances and impacts

- S & T has moved from small to large institutions and large budgets.
- Governments and business have increased funding of S & T, built institutions, put in place policies.
- S and T knowledge resides in human brains, private/public sector entities. Skilled human resources are an essential component, and underlies the knowledge economy.
- Disruptive effect – changes the balance of power, and economic activities – can increase inequalities, cause job displacements and losses
- Pursuit of economic and military power – control over technology –IPRs - formal and informal – denial regimes
- Means to acquire technology by overt and covert means. Indigenous development of technology.
- Policymakers and civil society face challenges – will continue to do so in the future.

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Science diplomacy

- Science diplomacy is analogous to economic, cultural or sports diplomacy.
- Formally defined by AAAS and RS in 2010, but has existed long before.
- It means full integration of science and technology into foreign policy and diplomacy.
- AAAS/RS 2010 definition of SD - Science in diplomacy (Science inputs into foreign policy),Diplomacy for science (international science collaboration activities), Science for diplomacy (improving relations through S &T)
- There are other ways of looking at Science Diplomacy, by various scholars. (1) advocacy, promotion , influence.(2) domestic, external , and global.
- For India, Science Diplomacy is important for supporting national development.

Science in diplomacy

- Increasing number of global challenges such as WMD controls, climate change, cybersecurity,
- These challenges are transborder, require application of science and technology, as well as diplomacy.
- Therefore S & T experts must dialogue with policy makers to fashion informed and appropriate diplomatic and foreign policy responses.
- Advanced countries have been setting the agenda and proposing solutions to global challenges while developing countries are at a disadvantage.
- Improving the scientific capacity of delegations from developing countries is particularly important, in areas such as climate change and health.
- Policy makers must have a minimum level of scientific knowledge.
- Scientists must communicate to stakeholders and the public,

Diplomacy for Science

- Use external relations to strengthen national STI ecosystem. Enhance S & T collaboration with advanced partners
- S & T intelligence gathering, advance information, and negotiating with those involved for access to important technology.
- More effective participation in negotiations on STI and global challenges.
- Facilitate participation in large international S & T programmes and projects
- Support for negotiating S & T exchanges and commercialization of S & T to secure economic benefits.
- Leverage STEM diaspora capabilities and attract and retain talent.

Diplomacy for Science – Mega Science Projects

- CERN Large Hadron Collider, ITER Fusion energy research, LIGO, TMT, SKA, etc – India is participating.
- Human Genome Project, International Space Station (ISS) – India did not participate
- SESAME Project in Jordan- Israel, Palestine and Arabs working together
- International Solar Alliance (ISA), ICGEB (1983-) – India invested substantial resources in these initiatives.
- All such projects require detailed international negotiations to finalize agreements. Diplomats and scientists need to work closely together.
- India can get access to cutting edge science with relatively low investment.
- With costs of basic research rising, more such international projects are likely.
- Projects may be single mega facility (CERN), or big networked type (HGP, LIGO, etc)

Diplomacy for STI – the Development dimension

- S & T for development is critical for many developing countries.
- Development to be seen in widest context – including national security.
- Target – achieve development goals – 17 SDGs by 2030. Technology Facilitation Mechanism (TFM) set up under UN for meeting SDG targets.
- Niti Aayog is coordination agency for the SDGs
- Importance of experience sharing among the South, frugal innovation.
- S-S cooperation can be beneficial, access to resources, generate business activity.

The S&T ecosytem

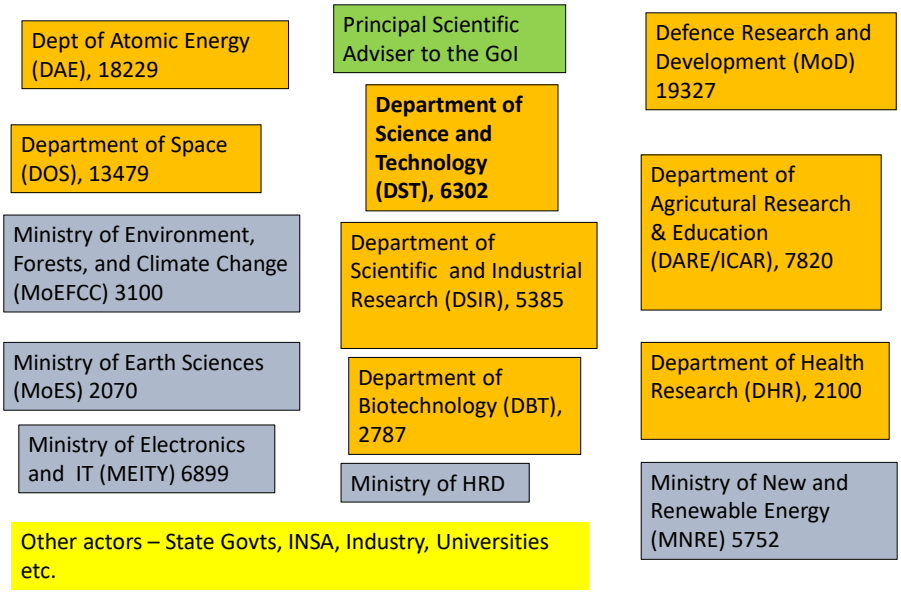
- Government S & T departments, State and Local government agencies.
- Research institutions, Academic institutions – teaching and research work – private and public
- Funding mechanisms for R & D,
- Regulatory agencies , eg medical research, etc.
- IPR system, commercialization of S & T, incubators, business environment.
- Business community – business development
- Civil society – consumers, social activists
- Strong ecosystem can attract and retain global talent.

India S & T ecosystem data

- India's Gross Expenditure on R and D as % of GDP (GERD) was 0.7 % of GDP (2016-17), much below that in major nations such as the US (2.8), China (2.1), Israel (4.3) and Korea (4.2).
- The number of Researchers per million population in India was 218 in 2015 , well below that of China (1200), Brazil (884), Russia (3000), and South Africa (473).
- Break up of Gross Expenditure on R&D (GERD) - Central Government 45.1%, State Governments 7.4%, Higher Education 3.9% and Public Sector Industries 5.5%, Private Sector Industries contributing 38.1%.
- The R & D spending of central government agencies is dominated by 8 major scientific agencies.
- Higher Education Sector participation in GERD by India is quite low. Many Universities lag in R&D.
- New Education Policy 2020 and new draft STI Policy aims to improve performance.

India - Central Government – Main S & T related Departments

(Extracted from 2020-21 budget Rs Crores Total budget = 3,042,230 crores)



Indian Bilateral S & T agreements

- Bilateral framework agreement – cost sharing, sharing of IPRs, facilitation clauses, joint implementation committee, etc.
- Programme of cooperation, specific activities, partners identified, project approval and monitoring, etc.
- DST - bilateral S&T cooperation agreements with 83 countries of which there is active cooperation with 44 countries.
- DAE – agreements in nuclear energy with 13 countries
- DOS – agreements with 36 foreign entities.
- Dispersed nature of S & T cooperation agreements. Need for better coordination and exploiting synergy.

Present network for S & T cooperation

- 4 Science Counsellors located in Washington, Moscow, Berlin and Tokyo; recruited by DST for 3 year assignment.
- Scientific Officers from DAE at Paris, Vienna and Moscow; from ISRO at Paris and Washington, from DRDO at Washington.
- For the rest of the countries S & T cooperation work is handled from India. Event driven, mostly during HL visits.
- In most other countries, S & T related work is handled by IFS officers doing economic/commercial or education/culture work. Initiative is largely left to HoM.
- No SA in important countries such as China, Israel, UK, Belgium (for EU), Rep of Korea, etc.
- Much smaller network compared to USA, France, Japan, UK, Russia, etc.
- Need to enhance S & T cooperation work at country level, and better coordination in India.

Science for Diplomacy

- S & T partnerships can help bridge differences among countries.
- Examples US/USSR, US/N Korea, US/Cuba, Middle East(SESAME), etc.
- S & T contacts can help build confidence and provide alternative channels for communication.
- S & T cooperation to tackle common problems can strengthen relations with neighbours.
- Example South Asia – challenges of air pollution, disease control, water management, energy networks, etc.
- Similar to cultural or sports diplomacy.

Science for Diplomacy - examples

- Science cooperation agreements between the US/USSR and US/China in the 1970s and 1980s, US/Cuba(since 1997), etc.
- Creation of new institutions- CERN(Geneva, with 20 states) , ISS(with 5 space agencies), ITER, etc.
- SESAME(located in Jordan with 8 members including Israel and ME States, and 17 observer states)
- Iran nuclear agreement (P5+1 and Iran)
- Arctic Science Agreement, 2017

The Covid challenge and responses

- India suffered from the outbreak, economic disruption, loos of lives, etc.
- International response coordinated by WHO has several gaps – being filled – new instrument being drafted, strengthening WHO funding, international health regulations, etc. India engaged actively in this effort.
- India stepped up vaccination internally and supplied vaccines to many countries . Diverse vaccines approved, including with indigenous technology (Covaxin, etc).
- India also stepped up manufacture of protective equipment, diagnostics and therapeutics.
- Proposed temporary suspension of IPRs on Covid related products, seeks to improve global access and affordability.
- Uses UCT tools effectively for contact tracing amd vaccination management
- Exposed weaknesses in public health infrastructure

Nuclear Technology

- India has emerged from nuclear isolation, NSG waiver, agreements for nuclear fuel and civil reactors. Trying to gain entry into the NSG
- Maintained its independent strategic nuclear programme like other NWSs.
- Facing challenges to join CTBT, FMCT, N-weapons ban treaty of 2017, etc. Challenges of dealing with nuclear armed Pakistan and China. Policy of No First Use (NFU).
- Challenges of Iran's nuclear policy and ambitions. Non mebbers of NBPT with NWs- India, Pakistan, Israel, N Korea.
- Ambitious civil nuclear programme – natural Uranium fuelled Pressurized Heavy Water reactors (Candu type), and imported enriched Uranium fuelled Pressurized Water Reactors.
- Developing Fast Breeder reactors using Thorium for third stage of nuclear programme.
- India will need to be actively engaged in all aspects of nuclear technology discussions at global level.

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Climate change and energy

- India plays a key role in global efforts due to its size and economic growth. No solution possible without India
- GHGs emissions have to be reduced to avoid major climate changes (1.5 to 2 deg C limits). How to share the reductions? Climate justice and per capita emissions.
- Need for space for India's economic development. Reduce dependency on fossil fuels and pursue all non fossil fuels based energy, especially solar energy.
- New technology and finance for low GHG path and for GHG removal (CCUS Technology).
- Tax on GHG emissions ("Carbon Tax")
- Failure of international negotiations and role of civil society. Role of subnational entities, for example large States in the US
- New issues at Katowice COP – "just transition"
- India is doing its share to fight climate change. Targets for RE, Peak emissions, etc.

ICGEB - International Centre for Genetic Engineering and Biotechnology

- Promoted by India and Italy
- Headquartered in New Delhi and Trieste, additional Centre in Cape Town. Network of affiliated Centres.
- Established under UNIDO, 1983; Became an independent IGO in 1994; 65 Member States.
- Lack of support from advanced countries (USA). Financial situation weak.
- Provided access to biotechnology for researchers from developing countries.
- Importance of strengthening Bio Weapons Convention against use of dangerous pathogens

International Solar Alliance

- Aims at boosting solar power capacity especially in tropical region countries (within 23.5% degrees latitude N and S, recent charter amendment opens membership to all UN members. Germany, Italy, US have agreed to join
- Aims to mobilize all kinds of resources including finance, technology, equipment, knowledge for solar energy projects and implement them. Networking approach.
- Partnerships with World Bank and IFIs to mobilize $ 1000 bn by 2030 for solar energy.
- Sharing of research and development knowledge and best practices. Stimulate related industries and create employment.
- Help in achieving climate change targets. National solar power plans to be supported.
- International treaty and agency created based in Delhi.
- NTPC selected to implement a project for 900 MW of Solar power in Cuba through ISA

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ICT revolution

- Use of internet, computing and mobile devices rapidly increasing - major transformative ongoing change.
- Digital manufacturing and Artificial Intelligence hold out new promises but also challenges – job disruptions.
- Explosion of social media poses new challenges – deliberate misuse for destabilizing societies-elections interference. Cyber terrorism.
- New problems of information and cyber security, and cyber crime - Cyber crime treaty needs revision
- New kinds of warfare in cyber space- need for rules similar to Geneva Conventions.
- Regulation of use of AI enabled Lethal Autonomous Weapons (LAWs)
- Regulation of crypto currency.
- ICT enabling of healthcare, education, business and government processes

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Life Sciences

- Life sciences -rapid expansion of knowledge about life itself- DNA revolution. Growing capability to manipulate and change life forms poses challenges – transgenic life forms, artificial genes, IPRs.
- Great potential impact on human health, agriculture, and environment protection.
- Regulation of R & D in biosciences, gene therapy, gain of function, reproduction, etc.
- Measures needed to contain potential harmful effects of application of biotechnology especially by non-state actors. May require regulation of research and strengthening of the BW Convention.
- Ethical issues arising from genetic modification of human embryos, and new technology for human reproduction, for example, need to be addressed.
- Biodiversity – CBD implementation

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Managing the Oceans

- Present approach emphasizes different levels of sovereignty over ocean space and national interests such as navigation rights, security, fishing, and mineral resources . But the oceans and the living resources therein are in a single inter connected space.
- Conflicts and disputes arise - South China Sea, the Arctic, etc.
- Living resources of the oceans are an important source of food and livelihood for millions - risks due to overexploitation, pollution and failure to adopt sustainable management practices
- New patterns and models for managing the oceans are needed. The Large Marine Ecosystem (LME) concept under GEF. Marine Protected Areas.
- Arabian Sea and Bay of Bengal LMEs are at high risk, need joint action by coastal states.
- PMs remarks at recent One Ocean summit in Brest 2022 welcome. India has joined the 27 member coalition of countries pushing for more ambitious efforts at upcoming UN BBNJ treaty negotiations.

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Space challenges

- Satellite platforms are inherently dual use – can be used for surveillance and communications.
- Militarization of space – use of space-based assets for C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance).
- Militarisation of space – use of space or earth based weapons against space targets.
- Negotiations over ASAT – US, Russia, China have developed ASAT weapons.
- Space debris – no binding international regulatory framework and no progress
- Mineral rights from outer space issues, human habitats in space.
- 5 Conventions and 5 declarations adopted (UNOOSA)

Some other issues

- Technology Control regimes – NSG, AG, MTCR, WA
- IPR issues and expansion into genomics, health care.
- Aerospace – ASAT weapons control, Outer space legal regime (Artemis guidelines by US), etc.

Engaging with STEM Diaspora

- Indian STEM diaspora is very important knowledge creator in many countries, also originate start ups.Need to get Indian STEM diaspora more strongly engaged with Indian STI ecosystem
- Central, State and local governments, Universities, and Business can facilitate engagement.
- Flexible policies needed , simplify processes and remove bureaucratic delays . This will attract and retain global talent.
- Institutions can provide opportunities for visiting scientists, short term work assignments/sabbaticals, networking and joint research, greater use of ICT tools
- Harness alumni connections, make alumni associations stronger.
- CSIR Prabhass initative, Ramanujan and Ramalingaswami fellowships are a few initiatives by government.
- NEP 2020 provides greater opportunities for diaspora scientists to work with Indian universities

Conclusions

- International agendas and frameworks for S & T have been largely shaped by advanced countries.
- Developing countries need to integrate S&T into their diplomacy.
- S & T developments will give rise to new challenges for diplomacy and public policy.
- Diplomacy for Science can be a powerful tool for development and achieving the SDGs.

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Thank you