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STI for SDGs: G20 Partnership and National Imperatives*

Background

COVID-19 pandemic has created unprecedented momentum and cooperation in leveraging Science, Technology and Innovation (STI) through, for example, vaccine research, improvisation on therapeutics, and the development of affordable diagnostic kits, as well as other solutions that enable safety and hygiene. The G20 countries, being at the forefront of STI, are leading such efforts. The mounting global challenges, be it the COVID-19 pandemic, climate change, or equitable social development, all require meaningful solutions derived from the combined power of (STI) and the convergence of wide-ranging technology domains. For example, material science or drug discovery today is critically dependent on precision equipment, computable algorithms and data processing. However, capacities greatly vary across countries in this regard, with widening technological distance perpetuated by a lack of access and resources, rather than often cited conditions, such as adoption lags. In 2019, individuals using the internet as a percentage of the population were 28.2 % for Africa, 48.4 per cent for Asia Pacific countries, and 51.6 per cent for the Arab States (International Telecommunication Union). While digitalisation enables leapfrogging and ensures access, sub-optimum outcomes may still be observed as pathways might vary from one country to the other. Despite this, in general, countries are aware of the leapfrogging benefits of technological change.

Under the ongoing efforts of the Technology Facilitation Mechanism (TFM) of the Agenda 2030, the UN has already launched the first phase of the Global Pilot Programme on STI for SDGs Roadmaps in 2019, initially with five pilot countries: Ethiopia, Ghana, India, Kenya, and Serbia. The European Union and Japan have joined the Programme to strengthen the international partnerships. Several countries in Africa, and other less developed regions, continue to lack the access and means to leverage technology. Therefore, the inclusion of three African nations in the Programme (viz. Ghana, Ethiopia and Kenya) is an encouraging development. Local capacities are not sufficient and global technology regimes are strongly biased in favour of technology producer countries. Efforts should be made to dismantle barriers to technology access and transfer to enable inclusive and sustainable development globally. Agriculture,

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health, water, energy, urbanisation, and mobility solutions all need sustainable, inclusive, and affordable technologies that can be scaled. In the near- to medium-term, the focus should be on "strengthening national capacities for science-based decision making, enhancing public trust in science, sharing knowledge for more collaborative research, ensuring universal access to solutions, and acting with greater urgency on global scientific assessments" (Roehrl, Liu, and Mukherjee 2020, p. 1).

The G20 Osaka Summit has made the most important contribution in recent times in acknowledging importance of science, technology and innovation (STI) in achieving the Agenda 2030 and the Sustainable Development Goals (SDGs), and the larger aspirations of inclusive and sustainable economic growth. The G20 Summit declaration in 2019 endorsed the draft UN "Guiding Principles for the Development of STI for SDGs Roadmaps" in this regard. Given that 2030 is fast approaching, the UN reinforced a new political declaration in 2019: "Gearing up for a decade of action and delivery for sustainable development."[1] In addition, with the strong ownership articulated by the G20 leaders in promoting STI for SDGs, it is important that this mandate is taken forward by member countries that have significant influence on global governance architectures and the means to implement SDG 17 in order to support the STI for SDGs Roadmaps and take concrete steps towards operationalising a global TFM. An analysis of opportunities and challenges would inform and shape collective actions at the G20 in a post-COVID-19 world, with lessons from the ongoing pandemic in which both science and civilisation have been challenged in unimaginable ways.

A Global Technology Facilitation Mechanism and G20 Role in Resource Mobilisation

The TFM and other similar initiatives, like the Technology Bank for Least Developed Countries (LDCs), the Climate Technology Centre and Network of the United Nations Framework Convention on Climate Change, the National Cleaner Production Centre Initiative, the Green Industry Platform, the Global Environment Facility, and the Green Climate Fund, need to be strengthened to make ensure meaningful impact. This cannot happen without financing mechanisms, needs assessments, stakeholder participation, and most importantly, STI value chain participants that are well placed to create and propagate global public goods (that address public health, climate change, food security, watershed management, environmental pollution, etc.). Developed countries have a critical role to play in facilitating the above, by promoting appropriate global regimes and fulfilling desired official development assistance commitments, while developing countries should make extensive efforts to internalise technology driven approaches in development and sustainability interventions. Many countries in the developing world, like India, have already experienced large-scale, technology-driven development transformations, along with policy lessons on the path to overcoming longstanding access barriers.

The baseline idea embedded in the TFM proposal has made limited progress in terms of providing technological choices. While deliberations among various UN agencies and other stakeholders have been fruitful in the last couple of years, the Global Pilot Programme on STI for SDGs Roadmaps is the first concrete operational plan to document, improve, and encourage STI for SDG interventions. If a speedy outcome is desired, UN agencies should make an effort to work among themselves on this issue. In addition, they should also make the proposal more concrete and present it— through global platforms like the G20, thereby providing momentum to the process—to leaders who are already committed toward the fulfillment of the SDGs. The G20 countries should make every effort to support the process already being incubated at the UN. Specialised UN agencies can contribute through their experience, resources, and repositories in building such a platform. The United Nations Interagency

[1] https://www.un.org/development/desa/en/news/sustainable/sdg-summit-kickstarts-ambitious-action-to-deliver-for-people-and-the-planet.html

Task Team (UN-IATT) is best placed to coordinate this activity. This could serve to minimise duplication of ideas and efforts and should not only help potential seekers of technology but also UN agencies themselves in understanding cross-agency strengths and how those can be leveraged to strengthen ongoing interventions (Chaturvedi and Saha 2016). The UN guidebook for the preparation of STI for SDGs Roadmaps captures this idea along three action areas, namely building country STI capacity, boosting international STI flows, and brokering STI coalitions.

While the TFM is intended to be a global project, it is important to understand the rationale behind anchoring efforts of the TFM at the national level among member countries, for two reasons. First, countries and their public funded R&D agencies, as well as international development finance organisations, are aware that development-oriented and sustainable technologies may continue to remain under private intellectual property ownership, unless alternate innovation models are encouraged. Second, many technologies that are primarily developed with strategic needs in mind can serve dual purposes toward development and non-traditional security. Hence, there is a need for wider applications with reasonable safeguards.

The G20 countries should make every effort to support the UN-led initiative and, as a group, should facilitate the action agenda to promote STI for SDGs Roadmaps. Multilateral development banks (MDBs) play an important role in providing concessional finance and technical assistance across developing countries. The G20 countries have significant influence on the global financial architecture, including all old and new MDBs. This provides an opportunity to explore the effective ways in which the G20 might play a more proactive role in mandating the MDBs to finance innovation projects and capacity building, particularly in developing countries, to align their objectives with those of the TFM.

MDBs focus on poverty alleviation, creating capacities, and developing infrastructure. Futuristic infrastructure development demands sustainability, resilience, and inclusiveness. It requires additional demands, including replacement and retro-fitting, new and integrated mobility solutions, smart cities, and green industrialisation. Such rapid transformations are being made possible through technological innovations with their respective pilots and mass adoption, with active involvement of multiple stakeholders—the government, innovative financing, development finance institutions, and the private sector. Financing such initiatives and the underlying innovation projects holds key relevance for sustainable development, universally. The G20, as a platform, should be fully informed of such developments and develop the means to support such endeavors over the medium and long term toward the fulfillment of the SDGs.

Localisation of SDGs and relevance of STI for SDGs Roadmaps

The intention for using STI for SDGs is to carry forward successful experiences in a more integrated and convergent manner, which can enable sustainable development transformations; promote sustainable consumption and production; create greater equity in development; improve all parameters of human development; deepen resilience against emerging challenges; and chart a futuristic course of development for the 21st century. The timelines for SDGs should trigger such aspirations in all nations and societies. Proactive policy measures in this direction would strengthen the resolve and streamline deliverables.

The G20 members have been engaged in STI-related initiatives domestically, and through international collaborations. The success of many of these countries, spanning both developed and emerging economies, have served to strengthen global efforts, as well as local capacities, across many other countries. It is important that better synergy is established between national, regional, and global priorities in the interconnected

domains of development and sustainability, while considering the SDGs. Two key outcomes would be: (1) understanding the nature of contributions made by these countries toward STI for SDGs efforts globally and (2) adding to the information base of localisation strategies on STI for SDGs—institutional frameworks, financing mechanisms, innovation, deployment, gap analyses, and outcome indicators, among others. In this context it may be noteworthy that the Government of India is contributing to the inventory and revival of springs in the Himalayas for water security (NITI Ayog 2018). In order to promote regional, public goods, several initiatives are needed for the protection of biodiversity, the marine habitat, and the Arctic.

However, outcome- and process-based indicators for STI, and their linkages with development and sustainability, would be crucial for resource allocation and institutional interventions. The following need to be emphasised: experience sharing, pooling existing databases and indicator frameworks, and filling the knowledge gaps and methodological challenges. Thus far, SDG-inspired indicators have not been completely effective; innovative methodologies and alternate indicators may be required to make effective policy choices. For example, in the Indian context, the National Indicator Framework, approved by the Government of India, was found to be inadequate in terms of incorporating STI indicators across SDGs (Kumar and Anand 2018).

For effective outcomes under the Global Pilot Programme on STI for SDGs Roadmaps, a baseline survey will be required for examining the STI-related parameters, linking STI with specific target-level indicators, resources, and capabilities, as well as inter-departmental/inter-agency activities. In addition, the roadmaps should address gaps in indicators and facilitate development of relevant indicators, besides identifying appropriate guidelines—with methodologies—for collection, compilation, and management of data. In this context, the roadmaps should broadly be shaped through partnerships and information metrics. The adopted framework under the Pilot Programme must be nimble and informed of local contexts, sector specificities, and the efficiency with which it makes generalisations at the global level. Developing countries have also focused on building capabilities and skills to harness existing technologies, as well as make effective use of the potential offered by emerging technologies, while considering the associated risks and challenges (Dahlman 2019). Therefore, based on the accumulated experience, STI for SDGs Roadmaps should offer an avenue for governments and stakeholders in developing countries to consolidate and integrate their efforts toward achieving the SDG targets across goals, while catering to their inter-connectedness. Such initiatives on integrating STI policies and programmes with SDGs are underway in some Asian countries (UNESCAP 2018). It is also laudable that some of the African countries, particularly Kenya, have already taken initiatives to build STI for SDGs Roadmaps. We propose the following basic parameters for the STI for SDGs Roadmaps to support national-level efforts and facilitate international cooperation on STI:

- Means to build an ecosystem of institutions and processes for STI-SDGs, aided by data- and indicator-driven technology foresight, gap analysis, priority interventions, and qualitative information.
- Developing inventories and mapping mechanisms for technologies, financial resources, expenditure reviews, and capabilities, suited to (and dynamically adjusted to) existing and evolving ecosystems.
- Developing appropriate technology classification, in terms of use, stage of development, cost of development, ethical and socio-economic assessments, and ownership and technology transfer models. Wider application and potential of technologies in solving longstanding challenges should trigger faster adoption.

- Partnering with the private sector to improve development, deployment, and access to STI products and services; ensuring greater participation of the private sector in the National Innovation System; encouraging the private sector to invest more in R&D; and contributing to technology development aimed at fulfilling the objectives of the SDGs.[2]
- National agencies working on the above must also develop suitable information sharing mechanisms to strengthen the TFM and promote knowledge sharing (apart from tangible technology transfers with other countries).

The roadmaps should address gaps in indicators and facilitate development of relevant indicators, besides identifying appropriate guidelines—with methodologies—for accurate collection, compilation, and management of data; they should also address any existing gender gaps. The STI for SDGs Roadmap building efforts by nodal agencies should also explore the possibilities offered by inclusive, frugal, and responsible innovations in meeting the SDGs. In this regard, the Global Pilot Programme on STI for SDGs Roadmaps should enable robust experience sharing.

Making "STI for SDGs" central to Development Cooperation by G20 – Lessons from India

Technology, along with financial resources and robust monitoring frameworks are the most important means to implement the Agenda 2030. In this regard, the SDG 17 calls for North-South, South-South, and triangular partnerships. Accordingly, many countries have incorporated STI cooperation in their Development Assistance Programmes. These include initiatives like capacity building, bilateral collaborative R&D, and joint research in areas of mutual interest. Chaturvedi, Rehman, and Srinivas (2019) argue for the adoption of new models of innovation for global public goods. Below are some examples of successful STI-driven initiatives for achieving SDGs, in which we highlight some of India's South-South cooperation efforts for illustration, while noting that such efforts among countries are not new. For a long time, India has shared technology,[3] knowledge, and capacities with fellow developing countries and has immensely contributed to capacity building exercises in those countries. In recent years, the significance of such partnerships between developing countries has inspired confidence around deeper triangular partnerships (among developed and developing country partners for third country interventions in other developing countries), beyond exclusive North-South or South-South cooperation in areas intensively leveraging STI.

The universal nature of the SDGs and the global nature of challenges are expected to push the world toward deeper STI collaborations, sharing of information, and capacity building. The instrumentality of development cooperation should be fully utilized to facilitate the same in terms of resource mobilisation and horizontal partnerships in the framework of North–South, South–South, and triangular cooperation. In this regard, Africa needs greater support to avoid being left behind. As an example of emerging triangular cooperation, India—as a pilot country of the Global Pilot Programme on STI for SDGs Roadmaps—is joined by Japan—which is supporting the Programme—to jointly explore possibilities of cooperation on STI knowledge transfer and project implementation in pilot countries in Africa and other LDCs.

Below are some examples of India's cooperation projects anchored in knowledge, resources, capacity building and access to STI:

Technology cooperation: India's cooperation in solar energy

India is in the process of increasing renewable energy capacity by more than five times, from 32 GW in 2014 to 174 GW by 2022 (and 450 GW by 2030) of which 132 GW has already been installed. India's focus and efforts at solar energy generation is well acknowledged. Under the solar mission, India targets the deployment

[2] The Ministry of Corporate Affairs in India has made a significant amendment to the country's Corporate Social Responsibility (CSR) rules by allowing the use of CSR funds to promote R&D that enables SDGs.

[3] India has shared its publicly funded R&D and capacity building with other countries. It has also involved the private sector in the implementation of development cooperation projects, often replicating technology-driven interventions that have been successful domestically, like Green Revolution and several low-cost healthcare services. Technology transfer in development cooperation projects may be understood in a wider perspective, which includes both embodied and disembodied formats and are linked with goods, services, and expertise toward content adjustments, as per the absorptive capacities in partner countries.

of 20,000 MW of grid-connected solar power by 2022 and aims at reducing the cost of solar power generation in the country through aggressive R&D and domestic production of critical components. At the Paris Climate Summit (COP 21 in 2015), India was joined by France in launching the International Solar Alliance, an ideal multilateral model of partnership on knowledge and resource mobilisation for sustainability in recent times. India hosts the headquarters of this alliance of 121 prospective countries along the Tropics of Cancer and Capricorn that receive large amounts of sunlight. This platform is meant to address the special needs of these countries and generate larger amounts of investment and resources. By way of bilateral/South-South cooperation, India supported Mozambique in developing solar panel manufacturing capabilities for its rural electrification initiatives (Chaturvedi 2016).

Capacity building: India–Kenya cooperation for food security

The National Institute of Agricultural Extension Management, under the aegis of India's Ministry of Agriculture, has trained more than 1,500 agricultural practitioners from Kenya, including farmers, processors, extension workers, and policymakers in specialised farming practices to improve food productivity and income. The trained professionals are now applying their new knowledge and techniques in their respective organisations to contribute to their existing agricultural development and food and nutrition security programme. Further, India and Kenya have signed a memorandum of understanding for cooperation in the agriculture and allied sectors. India has also extended a line of credit of USD 100 million for Kenya's agricultural mechanisation. In 2016, the countries reinvigorated their partnership on issues of agricultural mechanisation and identified cooperation in agriculture and food security as a shared priority. This cooperation has helped Kenya to significantly gain from India's agricultural scientific innovations, which has not only made India self-sufficient in food production but also made it an exporter of food grains (Ali 2019).

Ensuring access to STI: Cooperation for vaccine development

The development of a vaccine to protect humans from SARS-CoV-2 is of topmost priority in the minds of all concerned. The next step would be to achieve equitable and fair distribution of the vaccine globally and make it accessible to all. India's success at domestic production of low-cost drugs and pharmaceuticals is unique in the developing world. It has emerged as a hub of vaccine production and research, both in the public and private sectors. Cuba, Brazil, and India have used South-South collaboration to develop vaccines, affordable diagnostics, and drugs to enhance access to developing countries and have ensured that these are affordable (Thorsteinsdóttir 2012). India has also been a strong supporter of multilateral efforts for vaccine development and distribution, being one of the largest producers and consumers of vaccines itself. One out of every six children in the world receive vaccines manufactured in India (Department of Biotechnology, India). During 2013–2020, India has contributed a total of US$12 million to *GAVI, the Vaccine Alliance,* and in the wake of the COVID-19 pandemic, it has pledged US$15 million to the global effort.

Towards Indian Presidency of G20 in 2022: Shaping the Agenda on STI for SDGs

In this Policy Brief we have referred to the ongoing efforts under UN promoted TFM (and the global pilot programme for STI for SDGs roadmaps associated with it) to elaborate on the challenges towards successfully embedding STI driven approaches for SDG implementation. This would necessitate both global cooperation towards institutional reforms and resource mobilisation as well as national ownership in identifying STI for SDGs roadmaps fully informed of

sectoral needs and technology availability. Given India's well recognised leadership on sustainable development as well as command over STI resources and applications, Indian presidency of the G20 should rightly adopt STI for SDGs as a preeminent theme to rally global consensus on access, equity and inclusion in STI to facilitate inclusive and sustainable development in all countries. There is urgent need to bring in institutional focus and make sincere efforts to bridge knowledge gaps and streamline means on transfer of technologies in sectors with highest deprivation scores in developing countries. India's long experience in knowledge sharing with other developing countries through its development cooperation initiatives should provide valuable insights in this regard and strengthen ongoing efforts through platforms like the global pilot programme on STI for SDGs roadmaps to support STI driven interventions in LDCs, particularly Africa.

It is well understood that developing countries continue to rely on knowledge and innovation—also true for advanced countries, with a few exceptions. The priorities of access, equity, and inclusion are of paramount importance and, therefore, traditional knowledge-sharing models need re-engineering based on a larger and universal development purpose. The G20 can play an effective role in influencing financial institutions and MDBs to develop guidelines and define progressive norms of global technology governance to facilitate technology transfer and support established innovation systems, as well as advanced models, such as mission-oriented projects, open innovations, and innovation networks. Further, financial institutions and MDBs, combined, have significant influence over technology transfer, specifically, the manner in which technology reaches developing countries through the private sector. This would enhance the credibility of UN-led processes, particularly the SDGs as a common goal. However, it does not take the lead away from UN in any sense, as the SDGs are accepted as universal goals. Therefore, the urgency at this point is to utilise all available global and regional platforms, including the G20, to achieve the same. The G20 can act as a guiding force in bringing multiple international agencies together, including UN agencies that are working on rigorously leveraging STI to expedite sustainable and inclusive development globally.

The STI for SDGs road-mapping exercise currently underway in India is expected to offer valuable lessons for similar initiatives in other countries. The biggest strength of this initiative is in terms of interagency/interdepartmental collaboration to develop STI for SDGs roadmaps. This also derives strength from the ongoing and extensive process of adopting a new Science, Technology and Innovation Policy 2020 for India. This landmark policy initiative has been a leading example of fresh and transformative policy approach in the wake of COVID-19 bringing science to the centre of national development agenda in ushering inclusivity, resilience and sustainability (and partnering with technology producers and users at all levels). This policy would offer significant direction to STI efforts towards a host of large scale technology led interventions, viz. financial inclusion, renewable energy, disaster resilience, sustainable agriculture, sustainable urbanisation, green production and universal healthcare. India is also very keen to promote knowledge sharing partnerships with developing countries for fulfilling the aspiration of STI for SDGs. In keeping with India's long experience of STI driven development cooperation efforts as well as strong partnership for multilateral governance of global public goods, as India's joins the G20 Troika larger attention needs to be devoted to institutionalising and transforming global cooperation on technology, wherein STI for SDGs may stand as the most important theme with direct relevance for people-centered sustainable development. It is important that a specific agenda for STI in LDCs and African nations is also adopted and partnerships are strengthened through the global pilot porgramme on STI for SDGs roadmaps.

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