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Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals

Note by the Secretariat

The President of the Economic and Social Council has the honour to transmit to the High-level Political Forum on Sustainable Development the Co-Chairs’ summary of the Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals, held in person with online participation on 5 and 6 May 2022, with an additional day of side events on 4 May. The Co-Chairs of the Forum, the Permanent Representative of the United Republic of Tanzania to the UN, Kennedy Gastorn, and the Permanent Representative of Ukraine to the UN, Sergiy Kyslytsya, were appointed by the President of the Council. The summary is being circulated pursuant to paragraph 123 of the Addis Ababa Action Agenda (General Assembly resolution 69/313) and paragraph 70 of the 2030 Agenda for Sustainable Development (Assembly resolution 70/1).
Co-Chairs’ Summary of the Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals

I. Introduction

1. The present summary represents a reflection of the broad discussions that took place during the Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals (STI Forum). The summary brings together a diverse set of views articulated through both formal and informal statements provided by stakeholders. The views presented do not necessarily represent opinions held or endorsed by the Co-Chairs or the Governments that they represent.

2. Pursuant to General Assembly resolution 70/1, on 5 and 6 May 2022, the President of the Economic and Social Council, Collen Vixen Kelapile, convened the seventh annual STI Forum. As a component of the Technology Facilitation Mechanism (TFM), the Forum is a venue to discuss cooperation in science, technology and innovation (STI) around thematic areas pertaining to the implementation of the Sustainable Development Goals (SDGs), bringing together all relevant stakeholders to actively contribute in their areas of expertise. The Forum provides a venue for facilitating interaction, matchmaking and the establishment of networks and multi-stakeholder partnerships. It also aims to identify and examine the needs and gaps in terms of technological solutions, scientific cooperation, innovation and capacity-building and to examine the impact of rapid technological change on the SDGs in the light of the COVID-19 pandemic.

3. The Permanent Representative of the United Republic of Tanzania to the UN, Kennedy Gastorn, and the Permanent Representative of Ukraine to the UN, Sergiy Kyslytsya, co-chaired the Forum. The Forum was jointly organized by the UN Inter-agency Task Team on Science, Technology and Innovation for the Sustainable Development Goals (IATT) led by DESA and UNCTAD, as well as by the Secretary General’s “10-Member Group of High-level Representatives of Civil Society, Private Sector and Scientific Community in support of the TFM” (10-Member-Group) serviced by DESA.

4. The opening of the Forum featured statements by the President of the Economic and Social Council, Collen Vixen Kelapile, the President General Assembly, Abdulla Shahid, and the Secretary-General of the UN (remarks delivered by the Under-Secretary-General for Economic and Social Affairs Liu Zhenmin).

5. Two keynote speakers set the scene for the Forum: Leela Devi Dookun-Luchoomun, Vice-Prime Minister and Minister of Education, Tertiary Education, Science and Technology of Mauritius; and Francis Collins, National science advisor to the President of the USA and the former Director of the National Institutes of Health.

6. The Forum was held in person at UN headquarters, with an online participation option which was the preferred option for most participants and speakers. The Forum was well attended, including representation from Governments, scientists, innovators, technology specialists, entrepreneurs and civil society. 33 national Government Ministers addressed the Forum. To facilitate online participation, the Forum utilized an online platform which brought together all official and informal sessions, events, exhibitions, and online booths. The Forum reached a record number of participants with more than 3800 participants registered on the online platform alone. Many more participated via alternative platforms or followed the Forum live on UN-Webtv. Recordings continue to be viewed. Online participation also facilitated strong...
engagement and networking between speakers and participants, e.g., 9,000 messages were sent between the participants on the dedicated online platform. The Forum included also a record number of sessions, special events and speakers. The official programme of the Forum featured 131 key speakers, and hundreds more spoke in 50 side events and other related events. 22 online virtual exhibition booths showcased winners of UN innovation competitions and of UN flagship publications on emerging science and technology. Many scientists and engineers from academia, private sector, UN system and from government entities submitted science-policy briefs to highlight key emerging issues arising from their research for which they proposed policy action. 65 of the briefs passed the peer-review and were made available in support of the Forum’s deliberations.

II. Highlights of discussions at the STI Forum

7. The Forum deliberated on the role of science, technology and innovation for “building back” from the COVID-19 pandemic and for accelerating progress towards the SDGs, with an emphasis on SDG4 on quality education, SDG5 on gender equality, SDG14 on life below water, SDG15 on life on land, and SDG17 on partnerships - the in-focus SDGs under review at HLPF this year.

8. The STI Forum provided a timely opportunity to identify solutions to a number of challenges the world is currently facing, ranging from the COVID-19 pandemic to the impacts of artificial intelligence, education and technology gaps, climate change, as well as the wider global impacts related to the war in Ukraine. These crises have been stopping or reversing years of development progress in many countries, threatening to put the SDGs out of reach, and to trigger a lost decade for developing countries. The Forum highlighted science, technology and innovation solutions to support the achievement of the SDGs.

9. Among other issues, the Forum examined the actions needed for enhancing national, regional and global innovation ecosystems and research cooperation and partnerships; the promises and potential risks of emerging science and technologies; and technology divides. It showcased concrete solutions in the areas of carbon dioxide removal technologies, and identified lessons-learnt for policy-makers from the latest sustainable development scenarios. It linked directly to IATT workstreams on STI4SDG roadmaps, emerging science and technologies, capacity building, gender, as well as to initiatives such as GSTIC, the Partnership in Action on STI4SDG Roadmaps, and ISC’s INGSA network.

10. The Forum also reflected on the role of innovation in education and addressed the need for closing the digital divides and for governance of digital public goods. The Forum concluded with a discussion of opportunities and the way forward for the TFM and associated global and regional initiatives. Good practices and policy recommendations were identified for facilitating the development, adoption and dissemination of sustainable technologies at a scale commensurate with the aspirations of the SDGs.

11. The Secretary General’s 10-Member Group moderated most of the sessions and provided elements of a vision on STI for the SDGs.

12. Selected messages and highlights of the forum are presented in the remainder of the present summary. Statements and presentations in the opening session laid out “big-picture” views of key issues, principles and policy responses, many of which were further elaborated on in later sessions.

A. Science, technology and innovation at the COVID-19 conjuncture
13. The Forum discussed the extraordinary circumstances created by the COVID-19 pandemic which has greatly aggravated inequalities, between and within countries, leaving the most vulnerable furthest behind. It is of paramount importance to include the most vulnerable, the very populations hardest hit, in emergency responses.

14. Solidarity is at the heart of building back better from the COVID-19 pandemic. Yet, many countries, especially in Africa, continue to lack vital medical supplies, and there is a pressing need to use technology for bridging the access gap and for reducing inequalities. International cooperation, including South-South cooperation and multi-stakeholder partnerships, need to be re-invigorated, in order to mobilise and harness STI to accelerate the progress towards sustainable recovery and development. The COVID-19 pandemic has brought to the fore the merits of multilateral, multi-stakeholder approach as well as the importance of further strengthening coordination and synergies between countries and academic institutions for optimizing the global, regional and national crises preparedness, response and recovery processes.

15. There is a pressing need for capacity building on medical and pharmaceutical technologies; on national emergency strategies and risk-informed and science-based STI policies that are responsive to local needs; and for strong and flexible public institutions beyond the health sector, in support of the wider SDGs. To better prepare for and manage crises, technical capacities related to information and data need to be strengthened. Knowledge generation should be treated as a public good, and the Forum highlighted the need for effective knowledge-sharing at global level.

16. In order to build resilience, targeted efforts are needed to engage marginalized populations, persons with disabilities and indigenous people, as well as women and girls, and young people in STI policy development and implementation processes.

17. Openness and transparency are of paramount importance. Scientists, engineers and innovators need to be able to voice contrarian opinions without fear of reprisal, and COVID-19 related policy decisions need be informed by scientific evidence.

18. Major progress is being made in research on new kinds of vaccines that will protect against COVID-19 and other coronaviruses, and on ways to prevent continued infections. Global cooperation on research and deployment and much increased levels of funding is urgently needed, to make sure the world is prepared and able to provide access to vaccines and related medical supplies for all.

B. Innovations in education: toward quality access and common good

19. The Forum discussed how to increase access to and quality of education and examined advancements in digital learning and education technologies (ed-tech), including in the context of the COVID-19 pandemic and beyond.

20. Education is a driving force that powers economies and societies, while promoting a more environmentally sustainable world. The purpose of education ought to be to teach students how to learn and to instil in them a lifelong love of learning, as well as the flexibility and resilience that they may need to innovate on short notice and adapt to external shocks.

21. Education methods in digital era should be tailored to the specific economic, social, ethnographic and technological situation of a community or a country. Digital technologies that are used for education may need to be adapted to the contexts where they are used, while ensuring certain human rights such as freedom of speech and access to information are respected. Developing self-awareness and self-reflection are indispensable so that students maintain their sense of belonging and identity according to their social, cultural, racial, and ethnic backgrounds in the context of their increasing participation and involvement in a digital globalized environment.
22. Transforming educational systems need to be aimed at building character, judgment, empathy, resilience, social awareness, and responsible citizenship, in addition to imparting knowledge. This requires education to strengthen social, emotional, and ethical learning grounded in basic human values such as compassion and solidarity. Grassroots-style, people-centred change is needed that takes into account local needs and cultural context instead of solely technological advances.

23. The important roles of teachers and educators needs to be recognized, including through policies that support their work. Teachers need adequate resources and continuous professional development. More support is needed for preparing teachers for using digital technologies and modern teaching methods. Hybrid formats, in particular, can tap into the latest knowledge, yet enable the human contact and nurturing environment that children often need for their development. New policies, investments, and partnerships are needed to mobilise ed-tech for institutions, teachers, and students. Public education sector workers also need training on procurement of digital tools, on access to digital content, and on open-education resources.

24. The COVID-19 pandemic has impacted over 90 per cent of students globally. In addition to a loss of formal education, children and youth have experienced loss of social, emotional, and cognitive education which are critical to child development and academic learning. Many students have suffered adverse effects on their mental health from isolation and unsafe learning environments.

25. The COVID-19 pandemic has accelerated the adoption of digital technology for education and has created a shift in cultural attitudes towards ed-tech in those parts of the world with the necessary infrastructure. Technology is increasingly perceived as the point of arrival in the future of education, but it is important to note that, at a global level, the pandemic has exacerbated the gap in access to technology. Students need better access to digital devices and affordable, high-quality Internet connectivity. Technology alone is not interactive enough for child development, and the technology use frequently comes with trade-offs.

26. COVID-19 has shown the difficulty of explaining and understanding science. The level of science literacy in many parts of the world remains abysmal and, scientists struggle reaching the laypersons - there is a hierarchy of who should understand science and who is owed an explanation. This failure has led to the growth of misinformation, and to an unnecessary crisis in vaccination. People can understand science, and if they do not, better ways need to be found to explain it in their own contexts.

C. Global, national, and local innovation ecosystems and STI4SDG roadmaps

27. The Forum discussed ways in which global, national and local innovation ecosystems can be fostered, and it showcased local and national mission-oriented innovation approaches by Governments and various stakeholders. In particular, it discussed lessons from the IATT’s pilot programme on national STI4SDG roadmaps and highlighted good practices in policy and governance.

28. There is a need for strengthened and more coherent networks of innovation ecosystems, including among developing countries, as well as for long-term strategic funding for mission-oriented efforts, for creative ideas, innovators, and R&D programmes.

29. Each country's innovation path is particular to its culture and economic characteristics, yet a number of common systemic mechanisms and innovation policies can support sustainable development, especially in countries with medium or
low technological capacities. Mere technological upgrading along the existing trajectories is not enough, but holistic, national STI policies are needed.

30. Development of effective STI ecosystems and coordinated actions through STI4SDG roadmaps are essential elements of successful SDG strategies and actions. IATT’s global pilot programme on STI4SDG roadmaps has proven successful in the initial group of six pilot countries, as highlighted by Governments’ reports presented at the Forum. The roadmap processes have included activities, such as capacity needs assessments, STI ecosystem mappings, and new R&D initiatives. In some cases, efforts have also engaged the subnational government levels. Roadmaps have supported mainstreaming STI, aligning with national development planning, and have led to action plans to address societal challenges, including pandemic responses. Various tools have also been made available for roadmap development, for example, the smart specialization approach as a local, evidence-based and participatory priority setting process for R&D investments. The STI4SDG roadmaps initiative has also catalysed regional collaboration on entrepreneurship and STI multi-modality road-mapping in the Arab region.

31. STI4SDG roadmaps are based on multi-stakeholder and multisectoral policy engagement. This requires a shared terminology and understanding of the STI policy concepts. In this context, IATT published an interagency guidebook together with an operational note and a MOCC training course on STI4SDG roadmaps. Further synergies need to be built between this work and policy-making capacity building of IATT.

32. In order to effectively guide STI4SDG roadmap efforts in a scalable, equitable, systemic, collaborative and global manner, the 10-Member-Group has proposed the creation of an international network of “banks of ideas” and “funds for innovation”. It would become a repository for the identification of problems, opportunities and solutions, open to all. It would also become a mechanism for the generation, legal protection, management, and financing of a portfolio of best ideas, innovation projects and opportunities to create new, sustainable markets within the framework of the SDGs.

33. STI4SDG roadmaps could also support aspects of the voluntary national reviews (VNRs) of Governments which are presented every year at the HLPF. VNRs should take into account the cross-cutting and multi-stakeholder nature of STI for SDGs, acknowledging innovation as a horizontal enabler for all of the Goals.

D. Lessons from science-policy advice

34. The Forum emphasized that the interfaces between evidence, policy, and society have never been more visible and more critical than during the COVID-19 pandemic. The crisis has brought unprecedented shifts in the relationship between societies and science, between politics and evidence, and between society and their governments. Science advice for policy has come to be seen as both informing policy solutions and underpinning the public trust necessary to implement them successfully. The scientific method should be arbiter of trusted facts and could and should include the continued challenging of ideas.

35. The experience with the COVID-19 pandemic has made it clear that policy making needs to draw upon a broad range of natural and social scientific disciplines. Societies need to be able to take-up scientific data and evidence to inform policy-making processes.

36. Science advice in the multilateral system depends on the success and culture of science advice at national level and on the definition of effective processes at the

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1 Ethiopia, Ghana, India, Kenya, Serbia, and Ukraine.
multilateral level. The challenges at international level generally reflect the challenges of science advice at the national level. Distinctive mechanisms of evidence synthesis and of scientific advice brokering are needed.

36. Communications and engagement with risk-informed evidence is a core part of good science advice. The challenge lies in the fact that evidence about risk related to future hazards that are uncertain in the nature, timing and scale of their impacts is generally perceived differently than other scientific evidence. Understanding those differences will help creating and communicating the evidence about risk in ways that are more effective, and which lead to more timely attention from the policy community.

E. **Global digital public goods, digitalization, artificial intelligence, and connecting the world by 2030**

37. The Forum deliberated on the role of global digital public goods, on pervasive digitalization and artificial intelligence trends, and on what it might take to fully connect the world.

38. The COVID-19 pandemic has both accelerated the pace of digitalization and widened existing inequalities. Universal and high-quality access to the Internet and to a range of frontier technologies, platforms and data will be essential for achieving the SDGs.

39. Despite significant progress on digital connectivity during the pandemic, which saw global Internet usage rise by 40 percent during pandemic lockdowns, 2.9 billion people, 96% of whom are in developing countries, have never even accessed the Internet. The transformative power of digital technologies also comes with other challenges, ranging from issues of transparency, security, trust, privacy, biases, job losses, and rising socio-economic inequalities. Democratizing access will be essential. A digital data divide is emerging on top of the existing connectivity divide, and how to govern and harness large amounts of digital data for the global common good has become a major challenge. Globally, there are diverging approaches to the governance of data and of cross-border data flows. Innovative ways of global data governance are urgently needed, as the old ways may not be well suited to respond to the new realities.

40. Global digital public goods can be means for building common solutions to our common challenges and facilitate global cooperation. Public funding is essential for digital public goods, ensuring their inclusive governance and stakeholder participation. Global private capital is not investing enough in the ability of people to create public digital futures and infrastructure, resulting in great disparities.

41. Positive narratives are needed on digital innovation to offer visions of “digital utopias” that include sustainability and inclusiveness, including gender equality. In particular, a global, positive vision could oppose fragmentation. Internet governance by the people for the people, based on multi-stakeholder participation should be explored, and much could be learned from the multi-stakeholder model of the UN’s Internet Governance Forum.

42. The Global Digital Compact, proposed by the Secretary-General in his “Our Common Agenda” could strengthen global cooperation in this space. Its preparatory process should bring together stakeholders forging a common understanding of and adherence to common principles guiding our digital future. Discussions on global connectivity, the role of digital public goods, and on emerging technologies are all part of the UN’s broader efforts to build such shared understanding.

43. Global inequalities remain large, in terms of access to digitalization. Strengthened global cooperation among development partners, private sector and
other stakeholders, is needed to address key issues of lacking infrastructure, data skills and literacy. Efforts are needed at the international level, with an emphasis on finding common principles and objectives, to address interconnected global challenges, maximize gains of the digital economy and digitalization, ensure an equitable distribution of the gains, and minimize the risks involved.

44. Young people require training to equip them with the skills to engage and advocate for digital equality. Digital innovation and mentorship programmes can help in this regard.

F. Science and technology futures and scenarios for the SDGs and beyond – what is possible and what does it take?

45. The Forum took note of recent findings by leading scenario analysts from science and technology futures and scenarios. It looked at which goals are possible to achieve and what it would take in terms of policies and actions to achieve them.

46. Since 2015, scenario analysts have developed SDG scenarios emphasizing economic, technological, or political approaches. However, in the past eight years, unabated global increases in energy, materials and land use, together with their associated environmental, social and health consequences, have required analysts to make ever more ambitious assumptions to arrive at scenarios where the SDGs are achieved in the remaining fewer and fewer years.

47. Recent sustainable development scenarios show pathways towards ensuring decent living standards for all. This goes well beyond basic services and eradication of poverty, and addresses nutrition, shelter, health, socialization, and mobility. Less than one third of the current global average annual final energy consumption per capita is needed to provide decent living standards. The largest per capita gaps are in Sub-Saharan Africa, South Asia and Latin America, but regional differences remain sizable.

48. Energy gaps to ensure decent living are biggest in terms of transport across regions, but there are also sizable gaps in clean cooking cold storage, sanitation and cooling. The cooling gap is especially large in South Asia. In many parts of the Global South, cooling is among the fastest growing energy use in buildings, yet only rarely the focus of sustainability. Heat stress affects health and productivity of billions of people.

49. Without a successful rapid global sustainable energy transition, most of the other SDG ambitions will also remain out of reach. Clean energy solutions also have the potential to deliver universal energy access in a way that is safe and powers economic development for everyone.

50. Despite continued unsustainable trends, recent sustainable development scenarios show that the SDGs and our climate targets are still within reach. We can still ensure decent living standards for all, including in developing countries. We can halve malnourishment by 2030, achieve zero hunger by 2050, reduce extreme poverty to 180 million people by 2050 and ensure rapid income growth in developing countries.

51. For this to happen, we need to adopt the right policies as well as step up investments, research and sharing of technology with sustainable development as our ultimate objective. Effective governance and institutions are critical as is peace, international cooperation and solidarity. The energy transition is a powerful enabler for realizing all these advances, and the SDGs. In all areas, there is need for political will, focus, continuing research and development, and international cooperation and solidarity.
52. The UN should partner with the technology scenario community to translate their findings into accessible and easily understandable lessons and policy ideas, and to advise on the potentials of emerging technologies, potentially in form of a technology policy lab.

G. Emerging carbon dioxide removal technologies for addressing climate change

53. The Forum deliberated on the potential of emerging carbon dioxide removal (CDR) technologies for addressing climate change, in light of the findings of the IPCC’s 6th Assessment Report which highlights that need for CDR technologies, regardless of action on GHG emission reductions. Mitigation should remain the primary goal and is expected to accomplish around 90% of the GHG reductions, but CDRs could help filling the remaining gaps, especially in hard to decarbonize industries, such as steel, cement, and petrochemicals.

54. CDR technologies include both nature-based and technology solutions. They focus on terrestrial or ocean systems. For example, traditional methods such as biochar have long been used and provide agricultural co-benefits, and trees provide a nature-based solution for CDR. New technologies hold great potential, many of them are in the demonstration stage and would need to be brought to scale for which sizable investments are needed. Additional research is needed to assess their impacts on terrestrial and ocean ecosystems and to see how they will perform at scale in various parts of the world.

55. Low-tech CDR solutions such as biochar are often used in rural areas or areas occupied by indigenous communities. Special attention is needed to ensure that these technologies are implemented in a way that is both environmentally and socially sustainable.

56. At both national and international levels, specific policy agendas are needed to monitor, assess, and report on carbon removal, as well as to exploit economies of scale. International organizations could support establishing standards and promoting the use of CDR. New technologies such as drones, AI, and machine learning, can help monitor carbon emissions and the effectiveness of CDR. Sensors and digital technology could form the basis for reliable monitoring systems with international cooperation at their core.

57. To be truly sustainable, CDRs should act as a supplemental measure to climate mitigation actions; they should not be used as a justification for business-as-usual, particularly for carbon-intensive sectors. This will require the development of a GHG market for CDR, separate from GHG markets focused on mitigation.

H. Emerging science, frontier technologies, and the SDGs - perspectives from UN system and science and technology communities

58. Advancement of emerging science and frontier technologies is accelerating against the backdrop of today’s world marked by extreme uncertainties and complexities. The Forum discussed the potential and risks of such evolving science and technologies, particularly in relation to the achievement of the SDGs.

59. A number of new STI products and services have been made available, while existing standards remain inadequate to keep up with rapid technological changes. There is a pressing need for robust, integrated regulatory frameworks to drive the STI development in the right direction towards the achievement of the SDGs.

60. Participants underscored the need for local frameworks to guide AI technologies that are at the forefront of the 4th industrial revolution (“industry 4.0”). For instance, AI technologies may bring benefits of enhanced productivity and sustainability in the livelihoods of rural communities, but such possible solutions and efforts should be
demand-driven, based on grassroot realities and preceded by meaningful consultation with local stakeholders, including the most vulnerable.

61. It is critical for policymakers to consider potential socio-economic and environmental implications of AI already in its R&D stage and consider the entire life cycle of technology products and services.

62. Green windows of opportunities for development are inherently indigenous, so the national and local governments can own and develop tailored policy responses that work. Development cooperation has a key role to play to support indigenous strategies in support of sustainable development, including through South-South technology transfer.

63. New technologies can contribute to ensuring that no one is left behind and make marginalized populations more visible through data “scavenging”. For example, social media platforms can scan the state of play of participation by different demographic groups worldwide, thus providing meaningful insights to policymakers in real-time.

I. **TFM findings on the impacts of rapid technology change on the SDGs**

64. In line with the General Assembly resolutions 72/242 and 73/17, Assistant Secretary-General for Policy Coordination and Inter-Agency Affairs Maria-Francesca Spatolisano presented an update on the findings of the TFM on the impact of rapid technological change on the achievement of the SDGs. These findings documented by the inter-agency task team, represent a collaborative, multi-stakeholder effort, including by experts from the UN system and beyond, through various meetings and dedicated, peer reviewed science-policy briefs. Substantial contributions were made by the Secretary General’s 10-Member Group, expert staff from the UN system and many external experts.

65. The findings explored how things have changed through our experience with the COVID-19 pandemic and what they may mean for the way forward with regard to STI. It was concluded that the 2019 and 2021 TFM findings remained valid, but that new elements would need to be added, in particular, the following:

66. There are critical institutional gaps to be filled to support modern innovation systems. Among others, proposals have been put forward for the creation of a network of banks of ideas and funds for innovation, led by autonomous, ethical councils, as well as for a network of impact entrepreneurs and for advisory services.

67. Many existing engineering codes and standards are not adequate to address a changing climate. The global engineering profession should review and update them and scale up capacity building. The United Nations may wish to consider formally recognizing the role of engineering standards for the SDGs.

68. The next high-tech waves emerging from basic research labs are rapidly remaking development models. Much greater funding is needed for basic research and university-industry collaboration. Large corporations are increasingly in the lead. International “innovation cooperation” initiatives are needed to support joint demonstration projects by companies and public institutions.

69. Entirely new products and services with new characteristics are emerging that require specific regulatory and policy solutions. For example, “deep neural networks” now surpass human cognitive capabilities in narrow tasks. Unbeknownst to many, narrow AI has become ubiquitous in many countries, but billions remain excluded from its benefits.

70. Scientists need to develop accessible scenarios and define long-term goals to support global policy making. At the United Nations level, recent UNESCO
recommendations, on the ethics of artificial intelligence, and on open science, are very notable. Some have argued for a new “manifesto” for science, technology and innovation.

71. A major international effort is proposed to deploy and synthesize technology and scientific data for providing a real-time, global picture in support of decision-making on climate change, SDGs and human rights. This needs to include accessible, trustworthy information on the “break even” points for popular technologies. It could include sustainability footprint calculators bringing together everything we know from assessments of the “true costs” of technologies.

72. Science-policy briefs produced by the TFM also propose policy action related to a number of specific technologies, such as access to TinyML as a low-power, low-cost technology; molecular pharming; the metaverse; integrated advanced oxidation for water sanitation; modular 3D printing construction; cement recycling; bioplastics from urban waste; certified biodegradable materials; hydrometallurgy and recycling of electric vehicle batteries; urban food forests and aquaponics; cooling gaps; bladeless wind power; recycling of face masks; electrification and hydrogen for attaining carbon neutrality.

73. The findings of the TFM continue to highlight that the deep transformations required for the SDGs can only be achieved with rapid scientific and technological change. Going forward, the TFM findings point to areas for the work of the interagency task team and all its interested partners, in order to add value and advance understanding in support of decision-making.

J. Ministerial session on Science, Technology and Innovation for the SDGs and a sustainable recovery from the COVID-19 pandemic

74. The Forum included a Ministerial session which was closely aligned with the overall theme of the 2022 session of the HLPF, “Building back better from the coronavirus disease (COVID-19) while advancing the full implementation of the 2030 Agenda for Sustainable Development”. The discussion focused on good practices for equality, STI for SDGs Roadmaps, STI for resilience building, STI towards low-carbon economies and lessons learned in utilizing STI for SDGs 4, 5, 14 and 15.

75. The Forum heard the following countries share their experiences emphasizing the role of STI as a central element of national development strategies, policies, and programmes; the Philippines, Guatemala, China, Malaysia, South Africa, Dominican Republic, Armenia, Japan, Belarus, Ghana, Colombia, Thailand, Brazil, Poland, India, Oman, Portugal, Ecuador, Slovakia, Ukraine, Saudi Arabia, Honduras, Plurinational State of Bolivia, and the Russian Federation. Several countries also provided written statements and these statements are available on the STI Forum website.²

76. The following is a selective list of issues, challenges and recommendations:

77. The COVID-19 pandemic has caused untold suffering and major challenges to policymaking, but it has also provided an opportunity to reshape development paths. Decision-making has been substantially supported by the science community and data analysis. In some cases, this has led to the establishment of high-level committees to address the most pressing issues. STI initiatives remain critically important for a rapid recovery from the pandemic and for the achievement of the SDGs. Innovation benefits not only the economy through long-term growth, modernization of industry and jobs, but also addresses social and environmental concerns. STI plays a key role in climate action initiatives and policies.

78. Countries showcased numerous initiatives to enhance STI ecosystems. Funds for technology and innovation have been established in many countries, and competitions have bestowed awards to the most innovative ideas and research projects, including on medical and biomedical equipment, and new scholarships programmes have been created. Many countries have provided funding support to bridge the economic gap post-COVID-19, mitigating impacts on enterprises through the technological upgrading of micro, small and medium enterprises, in order to increase their competitiveness and productivity. Some governments have developed and financed technology-driven city, society and business models, focusing on areas such as poverty eradication, green and low-carbon industrial transitions.

79. Gender equality has been mainstreamed in many countries’ efforts to upskill citizens in the digital era, with priority attention given to women’s and girls’ participation in digital tools training and STI workforce.

80. The Forum heard many examples of the rapid uptake of digitalization since the start of the pandemic. Mobile applications and virtual platforms, in particular, have ensured continued delivery of public services and business transactions. Digital health applications have promoted people-centred health and disease prevention and improved the resilience of health systems. Health mobile applications have joined efforts with social media and drones in raising awareness on the pandemic impacts and gathering statistics.

81. Good practices on scaling up infrastructure & tools, programmes and services for smart hospitals and wards were also presented. A big push on vaccines research, manufacturing and distribution programmes continues, and access to vaccines should become a key element of future R&D efforts.

82. Connectivity is indispensable for the continued functioning of educational systems. The inclusiveness of STI initiatives is deeply intertwined with open access to Internet services. The vulnerable situation of rural communities raises concerns, as they are often excluded from national services coverage.

83. The development and application of high-tech, such as AI and quantum computing have been identified as a top priority by many countries. Deployment of such solutions is being scaled-up, but the increasing role of STI poses challenges with global reach, such as privacy rights and misinformation, which require global responses.

84. International, multistakeholder cooperation, involving policymakers, entrepreneurs, private sector, academia, youth, and civil society, is fundamental for achieving common goals. Pooling efforts can help with post-COVID recovery, especially in LDCs and SIDS, in view of their small economic size. Many partnerships have been launched to promote exchange and cooperation on research (e.g., the Atlantic International Research Centre), on innovation (e.g. the Latin American Network of Innovation Agencies), on vaccines, (e.g. the BRICS Vaccine R&D Centre), on energy (e.g. the China-Ghana-Zambia South-South cooperation on renewable energy technology transfer), and on STI4SDG roadmaps (e.g. deployment of high-tech devices in the production and distribution of spices in India).

K. Innovation exhibition and engagement with eminent women scientists and engineers

85. The Forum included a virtual exhibition drawing on the winners of recent UN innovation competitions by WTO, UNOOSA, UNWTO, UNIDO, World Food Forum, and UNECA. Innovators described their cutting-edge initiatives in 17 countries and shared insights on their solutions in economic development, vulnerable populations, environment, agriculture, and space applications.
A special feature was highlighting the work of three eminent women scientists and engineers. Women continue to be underrepresented in STEM, and their representation successively decreases in higher levels of academia and workplace bureaucracy. While there are successful models for improving inclusion, lacking political will and funding are key issues. The STI community needs to mainstream gender issues and make a concerted effort to direct technology solutions towards addressing the development challenges facing women.

In the context of climate change, there is a need for greater investment and political will to support technology and innovation for vulnerable and disadvantaged groups, including rural populations, low-income people, ethnic minorities, women, and youth. Women still face burdens due to limited access to energy and resources. As a result, they spend a great deal of time on manual labour in agriculture and water collection. There is a need for high-tech solutions for low-tech contexts to reduce the burden on women through technologies that reduce manual labour and increase income-generating opportunities.

L. Side events

The following TFM partners, including three national governments, organized a total of 50 side events on a wide range of topics: Italy, Slovenia, Department of Science and Innovation of South Africa, CTCN, Department of Global Communications, Dag Hammarskjöld Library, FAO, IAEA, ILO (on behalf of IATT WS10), International Trade Centre, ITU, Office of SG’s Tech Envoy, UNCTAD, UNDP, UNESCO, UNGIS, UNEP, UNIDO, UNDRR, WFP Innovation Accelerator, OOSA, WFF, WSIS, UNWTO, CANEUS, COBSEA, FILAC, Asia-Europe Foundation (ASEF), Inter-American Institute for Cooperation on Agriculture, WFEO, Aalen University, AfricaLics, Basel Institute of Commons and Economics, Gratia Christian College UNPRME, International Organisation of Employers, Science-Innovation Institute of Sustainable Development (Shenzhen), University College Dublin, Baha’I International Community, CANEUS, Carnegie Council for Ethics in International Affairs, Children Youth International, China Association for Science and Technology (CAST), Digital Leadership Institute, FILAC, HaritaDhara Research Development and Education Foundation, Impact Arts Society, International Association for the Advancement of Innovative Approaches to Global Challenges IAAI GloCha, IMCC, ISC, Major Group for Children and Youth, RedLATM (Regional Representative LAC Region-MGCY) & LACEMO, Results for Development, The National Academies of Sciences, Engineering, and Medicine, UNISC International, USCIB, WHEC, and XPRIZE.

M. Delivering on the SDGs: Next steps for the TFM and its partners

The Forum engaged in discussions on elements of a vision for the future of the TFM which were presented by the Secretary-General’s 10-Member-Group and based on the lessons learned since the mechanism’s inception in 2015. It was stressed that the STI Forum and the work related to the TFM have galvanized the understanding of the international community of the great potential STI holds to support the realization of the SDGs.

Interest in and demand for the TFM has continued to increase. The Forum in 2022 brought together more participants and portrayed a wider array of topics than ever before. The STI Forum now serves as a truly multi-stakeholder platform and space to renew a commitment to global cooperation and to discuss how to advance the 2030 Agenda. Increased efforts are, however, needed to involve a wider range of global science communities and civil society in the planning of and follow-up to the Forum, building on existing mechanisms and intersessional dialogue in online and offline formats. Calls were also made to ensure a deeper collaboration between the
TFM partners and Member States that are not currently participating in pilot projects on STI4SDG roadmaps.

91. While considerable progress has been made in the recent years, STI has not reached its full potential as a tool for SDG implementation due to lack of political will both at national and global levels, funding, as well as conflict of interests and unclear mandates.

92. Similar challenges apply to the Technology Facilitation Mechanism itself. To date, key parts of the TFM, including the STI Forum, have not received dedicated financial support, which is limiting the scope of its operations.

93. The IATT and its ten workstreams are mandated to promote coordination within the UN System on STI related matters, enhancing synergy and efficiency, particularly on capacity-building initiatives. The work streams have carried out useful work, including online trainings on STI policy design for more than 500 policymakers, and pilot projects on STI4SDG roadmaps, but scaling up these efforts is constrained by lack of funding.

94. The Secretary-General's 10-Member-Group is tasked with supporting the TFM, including the STI Forum. The Group discussed its shared vision and high priority actions for the SDGs until 2030 and beyond. It emphasized that technological change, science, and innovation are augmenting our world at an increasing speed, but that they are also generating an enormous divide in areas such as digital, educational, and technological capacities around the world, resulting in inequality and instability. The TFM and its STI Forum are well suited for assessing and monitoring these changes and highlighting the areas that need further policy action, investments, and governance structures.

95. The 10-Member-Group stressed the importance of strengthening local and national innovation. Such efforts can be complemented through universities and scientific institutions taking an active role in providing support for the existing innovation ecosystems and continuously enhancing innovation skills to extend the knowledge and attract global support, especially to promote sustainable innovation and development in the global South. The 10-Member-Group has therefore proposed the creation of a global network of “banks of ideas” and “funds for innovation”. Recommendations have also been made for the TFM to work more closely with research funders, collaboration that could be facilitated through the Global Research Council, which has funders from more than 55 countries.

96. A proposal was made for the next STI Forum to be held in a low-middle income country.

97. Member States were encouraged to join the Partnership in Action on STI4SDG roadmaps and to support the scaling up of the pilot programme to interested countries. The Partnership is a multistakeholder, informal technical group to support the STI roadmap work in the TFM. It contributes to knowledge sharing and distribution of lessons learned from STI for SDG and contributes to new collaborative projects and partnerships.

III. Recommendations for consideration

98. The Forum highlighted many practical examples and proposed recommendations for action by the UN system, Governments, businesses, scientists, academia, civil society and others. The necessity of international STI cooperation and of multi-stakeholder approaches was repeatedly underscored. The following issues may be considered by decision makers, in addition to the wider range of
recommendations on how to address the challenges in the areas contained in the previous section II above.

**General recommendations**

99. The world is grappling with overlapping challenges such as the COVID-19 pandemic, wars and conflicts, food insecurity, climate change, rising national debts, global supply chain disruptions, biodiversity loss, rising inflation and political mistrust. These disruptions risk melting away hard-won development gains but at the same time provide a moment for the world to re-think existing development paradigms. Longer-term thinking and planning, backed up by scientific knowledge and robust data, is needed to ensure that resources are used for sustainable solutions.

100. While considerable progress has been made in the recent years, STI has not reached its full potential for SDG implementation, including due to lack of political will, lack of funding, and conflicts of interest. The current trends in mainstream STI investments often support a “winner-takes-all” scenario in which one innovator prevails. There is a need to ensure more equitable sharing of benefits through new policies, regulation, open access technologies, access to knowledge, data and information, collaboration platforms and governance structures. The Forum also heard calls for demonetizing knowledge generation and strengthening decentralized discovery and manufacturing capacity for diagnostics, therapeutics, vaccines and food security, in order to ensure access, impact, and safety.

101. STI should be considered as an integral part of countries’ national planning, SDG implementation plans and monitoring efforts. The VNRs presented by the Member States at the HLPF offer an integrated way in which to assess each country’s overall progress, challenges and opportunities for effective SDG implementation. These reviews should also assess the potential that STI holds for boosting national efforts and to identify next steps.

**Recommendations on lessons from COVID-19**

102. STI have been in the global spotlight during the COVID-19 pandemic proving to be one of humanity’s most valuable resources for responding to global challenges and advancing the well-being of current and future generations. There is a need to ensure that this momentum is harnessed for further SDG implementation.

103. The pandemic has highlighted the need for just transformations that support sustainable, inclusive, and resilient societies. Rising inequalities and new forms of vulnerability that the pandemic has revealed have stressed this need. Now more than ever, it is important to embrace science-informed solutions that are grounded in inclusive and ethical innovation.

104. The pandemic has further highlighted the need for bridging the digital divide, enhancing digital literacy, strengthening national technology, science and innovation systems, breaking down gender barriers, and harnessing greater international cooperation and solidarity.

105. The pandemic has further stressed the need for ensuring context specific solutions that take into consideration the most vulnerable and the marginalized. There is a need for participatory decision-making processes and co-design of STI policies that engage all population groups, including women and girls, youth, persons with disabilities and indigenous people.

106. The scientific community had earlier raised alarm bells regarding the likelihood of a global pandemic such as the COVID-19 and these alarms went too often unnoticed. Current global understanding is that the risk for future pandemics remains high. Active learning is needed to ensure that the world and our STI systems are fit for future crises, including pandemics. Resilience towards future shocks will also
depend on how well the vulnerable and marginalized groups can be empowered to weather these shocks, utilizing STI as one of the tools. The UN must be better prepared for future pandemics and for dealing with incomplete and unfinished pandemics and epidemics, as the world’s interconnectedness and shared vulnerabilities demand a ‘one for all’ approach based on the principle of ‘no one is safe unless we are all safe’.

**Recommendations for the TFM**

107. The TFM should continue to bring together a wide variety of stakeholders, in line with its mandate, to discuss both the potential of STI and its challenges for the SDGs. New technologies and the current models of global digitalization raise legitimate questions of transparency, security, trust, privacy, biases, job losses, and rising socio-economic inequalities. The TFM should serve as the mechanism for acknowledging these concerns and offer an avenue for an open debate and collaboration to tackle them. It should also serve as the platform for forging new partnerships and scaling up solutions that work in a practical way. In general, the UN needs to be further strengthened to fulfil its mandates.

108. The TFM can and should facilitate discussions around emerging policy issues related to frontier technologies, their deployment, financing and governance. The STI Forum can provide a platform for discussions on how best to deploy these types of technologies for shared public benefit, and the TFM should continue work on these topics between the Forums.

109. TFM should help raise awareness around emerging technologies, discuss the needs for standards and regulations for their use and help ensuring that new technologies are promoted in a way that is environmentally, economically, and socially sustainable. There is a need to consider how the TFM can continue facilitating these discussions and make linkages with other relevant fora in between STI Forum sessions.

110. The global pilot programme on STI4SDG roadmaps has proved useful and lessons-learned from the work in the pilot countries should be widely shared with all Member States. Scaling up of the work could be done jointly with a number of relevant partners facilitated by the TFM, in order to ensure wider and lasting impacts.

111. STI aspects of the Secretary-General’s “Our Common Agenda” were widely discussed during the STI Forum. Further consideration should be given as to how the work of the TFM and the IATT fits into the processes proposed in the report, in order to ensure full compatibility of efforts. The Secretary General’s 10-Member-Group serves as an active part of the TFM and could contribute more directly to various workstreams on STI within the UN system. In particular, the 10-Member-Group has proposed the creation of a global network of “banks of ideas” and “funds for innovation”.

112. Synergies between the TFM, the STI Forum, the Commission for Science and Technology for Development, the Internet Governance Forum, Regional STI Forums, GSTIC, and other relevant events and initiatives should be further enhanced and collaboration strengthened.