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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 New York on 5 to 6 June 2018. The Co-Chairs of the forum, Deputy Permanent Representative of Japan to the United Nations, H.E. Dr. Toshiya Hoshino, and Deputy Permanent Representative of Mexico to the United Nations, H.E. Mr. Juan Sandoval-Mendiolea, 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 (SDGs). As such, it brings together a diverse set of opinions 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 they represent.

2. Pursuant to General Assembly resolution 70/1, on 5 and 6 June 2018, the President of the Economic and Social Council, H.E. Ms. Marie Chatardová, convened the third annual Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals, referred hereafter as "*the 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 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 between relevant stakeholders and multi-stakeholder partnerships in order to identify and examine technology needs and gaps, including with respect to scientific cooperation, innovation and capacity-building, and to help to facilitate the development, transfer and dissemination of relevant technologies for the Goals and targets.

3. The Deputy Permanent Representative of Mexico to the United Nations, H.E. Mr. Juan Sandoval-Mendiolea, and Deputy Permanent Representative of Japan to the United Nations, H.E. Dr. Toshiya Hoshino, co-chaired the forum. The forum was prepared by the United Nations Inter-Agency Task Team on Science, Technology and Innovation for the Sustainable Development Goals (IATT), with the support of the 10-Member Group of high-level representatives from civil society, the private sector and the scientific community.

4. The opening of the forum featured statements from H.E. Ms Marie Chatardova, President of ECOSOC, Ms Maria Luiza Ribeiro Viotti, Chef de Cabinet representing the UN Secretary-General, and Mr Liu Zhenmin, the UN Under-Secretary-General for Economic and Social Affairs.

5. Three keynote speakers set the scene for the forum: Mr Andrew Keen, author of the "The Internet is not the answer" and "How to fix the future"; Ms Noriko Arai, Professor, Japan National Institute of Informatics; and Mr Eric Garcetti, Mayor of Los Angeles, USA.

6. The forum was well attended, with an estimated 1,000 participants representing Governments, scientists, innovators, technology specialists, entrepreneurs and civil society representatives — broader participation than in 2017 and 2016. The forum comprised interactive sessions that engaged all stakeholders in the deliberations. In line with its mandate, the forum promoted networking and matchmaking, including through an exhibition of innovative solutions for the SDGs; innovation pitches by practitioners; a special event on the first solar-powered aircraft to circumnavigate the world; a roundtable of STI innovators, funders and other supporters; and 24 side events. It was convened back to back with the Global Solutions Summit, a special event of the Global Sustainable Technology & Conference (GSTIC), and several other events during the week.

7. The social media reach of the hashtags used for the forum, #Solutions4SDGs and #STIForum, was significant, with a reach of more than 3 and 13 million, respectively.

II. Highlights of the discussions at the forum

8. The forum deliberated on the challenges and technology solutions with transformative impact on each of the six Sustainable Development

Goals that are up for review at the high-level political forum in 2018: Goals 6, 7, 11, 12, and 15. In particular, it discussed the status of existing and new technologies, and explored the potential for how science, technology and innovation can support the achievement of SDG 6 on water and sanitation (Goal 6); discussed the main challenges for developing, adopting, disseminating or scaling renewable energy technologies (Goal 7); discussed the ways that STI shape urbanization and development to create human settlements that are inclusive, safe, resilient, and sustainable (Goal 11); identified good practices and policy recommendations, as well as challenges and needs, with a view to facilitating the development, scaling up adoption and dissemination of relevant technologies for sustainable consumption and production (Goal 12); and discussed the role of STI in protecting terrestrial ecosystems (Goal 15), as well as in producing significant advances for other SDGs..

9. The forum also addressed global trends and cross-cutting issues, including the "*Impact of rapid technological change on the achievement of the SDGs*" pursuant to General Assembly resolution A/RES/72/242; national STI for SDGs roadmaps for the SDGs and capacity building; local and indigenous knowledge, and home-grown innovations for the achievement of the SDGs; and next steps for the Technology Facilitation Mechanism. An interactive dialogue with the 10-Member Group of high-level representatives, newly appointed by the Secretary-General for 2018-2019, was an opportunity to engage on their vision for the TFM.

10. Selected messages and highlights of the forum are presented in the remainder of this summary.

11. Statements and presentations in the opening session layed out big picture views of key issues, principles and policy responses, many of which were further elaborated on in later session.

Impact of rapid technological change on the achievement of the SDGs

12. Pursuant to General Assembly resolution A/RES/72/242, Mr Elliott Harris, Chief Economist and Assistant Secretary General for Economic Development, UN Department for Economic and Social Affairs, presented "*initial findings of the Technology Facilitation Mechanism*" on the "*Impact of rapid technological change on the achievement of the SDGs*".[1] These preliminary findings, documented in an IATT information paper[2], represented a collaborative, multi-stakeholder effort with well over 100 expert contributors, including diverse stakeholders such as the International Council for Science, and the UN Major Group on Children and Youth. They synthesise the evidence and conclusions from eight meetings and sessions under the TFM umbrella[3];

[1] https://sustainabledevelopment.un.org/content/documents/27061ASG_Session_1_STIF_2018_Copy.pdf
[2] http://sustainabledevelopment.un.org/tfm
[3] The latest of these IATT expert group meetings was organized by DESA, UNCTAD, and ECLAC in Mexico city from 26-27 April 2018. The conclusions and recommendations of this "EGM on Rapid Technological Change, Artificial Intelligence, Automation, and Their Policy Implications for Sustainable Development Targets" are available at http://sustainabledevelopment.un.org/tfm

ten recent UN system reports and publications; written inputs from the 10-Member Group and from IATT comprising 36 UN entities; and 39 science-policy briefs. Mr Peter Major, Vice-Chair of the Commission on Science and Technology for Development, also presented an overview of the Commission's deliberations at its 21st session in Geneva from 14 to 18 May 2018, including a response to General Assembly resolution A/RES/72/242, which are presented in detail in the report of the CSTD.

13. Digital technologies, robotics, artificial intelligence and automation, biotechnology, and nanotechnology – all have fundamental and far-reaching impacts, opportunities and challenges, on the economy, society and environment and can already be felt in all countries.

14. These new technologies hold great promise for the SDGs. They could help eradicate poverty; bring high-quality education to all; help find cures for intractable diseases; expand mankind's knowledge base; significantly improve resource efficiencies; improve governance, accountability and inclusion; and make a fully renewable, circular economy possible thus fostering an era of abundance and cooperation rather than scarcity.

15. But there are also concerns about negative impacts. Benefits are not evenly distributed and unanticipated adverse consequences occur.

16. Artificial intelligence, the Internet of Things, and other technologies could further exacerbate wealth inequalities between rich

and poor, and it could cause mass unemployment, strains on governance systems, and reduced privacy and freedom despite greater connectivity and empowerment of civil society.

There are technology gaps between and within countries; between men and women; and across social groups. These gaps often correspond to differences in infrastructure, access and capacities.

17. We need to act proactively towards the objectives and targets of the 2030 Agenda and its aspiration to ‘leave no one behind.’ Systemic changes are needed, including in educational and training systems, skills and creative capacities.

18. Rapid technological change presents policy challenges that call for a stronger level of international cooperation. Many countries may need to find new kinds of development pathways that incorporate these technologies and that require a rethinking of patterns of employment and income.

19. Better knowledge and understanding of trends is needed for sound public policies and actions.

20. Calls for a more responsible and ethical deployment of technologies have to be balanced versus restraints on innovations that may deprive humanity of many benefits. These ethical considerations must derive from our shared vision – the values contained in the UN Charter, the Universal Declaration of Human Rights, and most recently

in the 2030 Agenda on Sustainable Development and the Addis Ababa Action Agenda.

21. Governments should fund science education and build the internal capacity of the next generation, especially including women and youth. The private sector has a positive role to play in building productive capacities in developing countries. Local capacity and appropriate regulatory frameworks are needed if domestic firms are to adopt and adapt technology as well as to develop domestic technologies, innovative ideas and developing sustainable solutions to tackling global challenges.

22. The awareness of policymakers needs to be raised in terms of the potential effects of accelerating technological change, and viable technology strategies should be elaborated in each country. Inclusivity and trust building is needed, as is participation of scientists in finding solutions for the SDGs. The UN could provide support through capacity building, and collection and dissemination of information and best practices. In this context, reference was made to the LDC Technology Bank, as well as to the idea of an African STI Forum and platform for research and information exchange.

23. These discussions have been ongoing in forum since 2016 and are likely to continue in the STI Forum and other forums at regional and national levels. The TFM is encouraged to continue its work in this regard, building on the “initial findings of the TFM”. Updates should

also rely on scientists, economists, academics, businesspersons, high-level public officials and other experts, including those from relevant United Nations agencies, in line with the prevailing practices since 2016. The UN should also assess and help countries with identifying and facilitating the implementation of good practices and public policy responses related to the SDGs, so as to mitigate the potential negative effects and harness the potential of rapid technological change.

National STI for SDGs roadmaps and capacity building

24. The challenge is to design STI policies and instruments for the Sustainable Development Goals that translate the Goals' universality principle into actions, while respecting national STI priorities and realities. STI for SDGs roadmaps for the SDGs can be important strategic tools for ensuring policy coherence and for linking the most pressing development challenges with solutions. STI for SDGs roadmaps are needed, ideally with measures for tracking progress.

25. A number of lessons have been learned from such national plans, policies and roadmaps. The cross-cutting nature of the SDGs and of STI requires holistic approaches and strategies. Multidisciplinary, integrated approaches are necessary. They should take into account different sources of knowledge, including traditional knowledge.

26. It is important to improve science ecosystems and to involve all relevant stakeholders in STI policy design, adaptation and application. Collaboration should be fostered among scientists, engineers, companies, public research and government institutions, and the end users of technological products.

27. Science and technology advisory systems should be engaged in all areas related to the implementation of the Goals and be independent of day-to-day politics. Cross-goal cooperation across sectors should be rewarded and policy instruments operationalised.

28. STI for SDGs roadmaps need to be customised to fit countries' circumstances and at the same time be harmonised worldwide to structure necessary knowledge and match problems with solutions.

29. Several countries shared their experiences emphasising the role of STI as a central element of national development strategies, policies, and programmes. Jamaica had adopted and resourced SDGs as an integral part of the national development plan, being implemented in a multi-sectoral, cross-ministerial and inter-generational manner linked directly to STI. Japan had promoted the vision of a human-centric and inclusive “Society 5.0” to create opportunities in physical and cyber spaces to leave no one behind, and it is promoting STI for SDGs roadmaps in international policy dialogues in 2019 through its Presidency of G20 meetings and taking opportunity of TICAD VII. Ghana emphasized the importance to align STI for SDGs roadmaps with

national development strategies and capacity building at tertiary school for women. The strategic development program Georgia 2020 fully integrates STI, through reforming financing for higher education and research, strengthening international research collaboration, and innovation ecosystems. Chile sought bringing together technological capabilities in a resilience institute for natural disasters.

30. Global partnerships are essential. Strengthened partnerships are needed between the private sector, academia, non-governmental organisations and young people. High-priority actions for these partnerships include global cooperation on science-policy interfaces, human capacity-building, multi-disciplinary innovations, and massive data processing and information technology platforms in support of the Goals. One example of such platforms is the Tropical Agriculture Platform – a G20 initiative led by FAO - aims to improve agricultural innovation capacities needs at individual and institutional levels within the fragmented agricultural innovation systems.

31. Some suggested that adopting a global public goods view of publicly-funded research could go a long way in finding cooperative solutions to the most pressing international SDG challenges.

32. Further international support, member State engagement, and partnerships with donors and the private sector will be needed to fill the critical gaps in data, finance, and effective implementation.

33. National “STI for SDGs roadmaps” can be a significant output of the TFM. They can help decision-makers in government and civil society as well as members of the public – from heads of state and finance ministers to citizens at the local level – to evaluate how the nation’s policies, investments, and actions are achieving the intended outcomes efficiently and effectively. UN experts in the IATT, 10-Member Group and among TFM stakeholders constitute an important source of expertise, as well as technical and financial support, which should be effectively mobilised.

34. Several IATT partners, most notably the World Bank, are currently exploring means and ways of better supporting STI for SDGs roadmaps.

Realizing the potential of local and indigenous knowledge, and home-grown innovations for the achievement of the SDGs

35. Important synergies can be realized between traditional, local and indigenous knowledge on the one hand and modern scientific knowledge on the other hand, leading to accelerated progress towards the SDGs.

36. Local and indigenous knowledge is not static, but dynamic and innovative. It is a dynamic system that is in practice enriched by other sources of knowledge. Co-production of knowledge typically is an important source of innovation.

37. Traditional knowledge has distinguishing features, in that it is acquired through interaction with the land, and that its very objective is to ensure survival. Culturally relevant tools are available that enable data collection from indigenous peoples and the promotion of community-driven research.

38. Local and indigenous knowledge has an important role in addressing complex global issues, such as biodiversity loss, weather risks, climate change, and desertification. However, conducive conditions and partnerships are needed to mobilize this knowledge.

39. Examples presented illustrated how traditional knowledge systems can be combined and integrated to complement scientific knowledge. Pastoralists in the Horn of Africa demonstrate how communities make critical livelihood decisions on the basis of sophisticated, systematic observations of the natural systems, coupled with information from weather services. Inuit foraging practices shed light on changing animal diets, driven by broader systemic changes. Brazil has a regular national dialogue with indigenous people. Mexican indigenous women use solar energy to produce organic honey. UNESCO combines indigenous knowledge with science.

40. Scaling-up and adapting local and indigenous knowledge and making it accessible to policymaking oftentimes requires support – from partners, Governments and the international community.

41. All relevant knowledge systems should have a voice at the STI Forum. Also, local and indigenous knowledge should be considered in the TFM deliberations on cross-cutting themes such as STI for SDGs roadmaps.

Science, Technology and Innovation for sustainable management of water and sanitation for all (Goal 6)

42. Access to clean water is a crucial foundation for poverty eradication and sustainable development. Today, over 2 billion people drink unsafe water and have to walk long distances to access water service, and more than 4.5 billion people do not have safely managed sanitation services. Worldwide, water demand is projected to grow by over 40% by 2050, with two-thirds of the world's population living in water-stressed countries already by 2025. At the same time, climate change contributes to increased variability of the amount of rain and its pattern, which makes water one of the most significant factors affecting social, economic and environmental dimensions of sustainable development.

43. In this regard, new materials, digital technologies, biotechnologies, nanotechnologies, and artificial intelligence hold great promise for the development of a range of high-efficiency water systems. There are promising small-scale applications of these technologies in developing

country's context, and there is the need to identify mechanisms to ensure the scale-up of these projects.

44. The UK promotes mechanisms that require partnerships between public and private sectors and the Forum noted several successful projects that harness the private sector to address water-related development needs, including tracking rainfall in African countries and supporting innovation of water quality testing in Bangladesh. Colombia is creating a partnership among government, universities, private sector and local communities are critical for design and implementation of rural and community operated aqueducts and sewage systems.

45. There is also the need to invest in STI and data to help better understand the role of water in the economic, environmental, social, political dimensions. For example, satellite data are used for meteorological modelling, and the Forum noted that this type of data had been used to produce the Africa Ground Water Atlas, an online resource that brings together high-quality data in 51 countries of new hydrological maps for Africa to help inform planning. Internet of Things related devices such as sensors, meters and mobile phones could also play a critical role in future water efficiency management. Particular attention must also be paid to technology to monitor and collect data on water consumption patterns to better accommodate user trends.

Science, technology and innovation for access to affordable, reliable, sustainable and modern energy for all (Goal 7)

46. Affordable access to essential services underpins development. Energy fuels many such services and to provide services to current and future generations, the energy-system itself needs to be sustainable. This energy system may impact and interact with the economy, society, and the environment, including other physical resource or commodity systems. The effects of this impact and interaction need to be managed sustainably. There are multiple benefits of applying a holistic approach to tackle energy, climate, water, health, and mobility challenges and build synergies between SDG 7 and other SDGs.

47. Universal energy access can be achieved. This progress would require upgrading and extend the energy grid to underserved areas, as well an integrated approach to support off-grid, mini-grid, and grid solutions to bring electricity services to areas without access to electricity. The costs of renewable energy technologies have fallen dramatically, and there has been a rapid increase in the deployment of these technologies combined with new business models. Furthermore, convergence between electricity and ICTs can contribute to increasing access to affordable, reliable, sustainable and modern energy for all.

48. Investment in new and efficient energy supply and end-use technologies needs to be promoted by policy frameworks and de-risking

strategies. Policy instruments should give stability and predictability to often substantive initial investments by the private sector. Furthermore, investment in research and development needs to increase and must be accompanied by the vigorous promotion of capacity building and education. Support for the local capacity building is essential, especially for young practitioners to learn about renewable energies and new business models. To tackle climate change, the development of renewables should also be complemented with carbon policies, including carbon prices and reforms in fossil fuel subsidies.

49. While technologically advanced products like electric cars soon would become more affordable and available, commercially available technology should continue to be promoted. Examples from Brazil ("renovabio policy") show that biorefinery has significant potential to be deployed at mass scale with de-carbonisation of liquid transport through ethanol use. However, such approaches need to balance impacts on land use, which could be detrimental to the overall objectives of the 2030 Agenda.

50. The Forum noted several examples of international cooperation in the promotion of STI for SDG 7, including the Horizon 2020 programme of the European Union and the mission innovation initiatives, and the project from Sweden to India to provide clean water.

Science, technology and innovation for inclusive, safe, resilient and sustainable cities and human settlements (Goal 11)

51. The scale and nature of human settlements at the beginning of the twenty-first century is unprecedented. Globalization, industrialisation, and urbanisation have led to the rapid growth of cities worldwide. In 2015, close to 4 billion people, or 54% of the world's population, lived in cities and that number is projected to increase to about 5 billion people by 2030. Rapid urbanisation has brought enormous challenges, including growing numbers of slum dwellers, increased air pollution, inadequate basic services and infrastructure, and unplanned urban sprawl, which also make cities more vulnerable to disasters. Better urban planning and management are needed to make the world's urban spaces more inclusive, safe, resilient and sustainable.

52. At the same time, cities are innovation hubs, and regions of high population density. Thus, they are at the centre of tackling the SDGs through technology. Enhancing the quality of life in the urban world would have a broader impact, spilling over into other SDGs beyond Goal 11.

53. For example, disease, depression and other concerns are by-products of poor urban conditions. Public health initiatives in urban settings must address those and related matters to changing the sensory design landscape. In smart cities, sensory design and their delivery

systems should promote wellness. To adapt to a denser population, any technology that was introduced to address a range of concerns, from high noise levels to air pollution, must be safe and protect the privacy of individuals. To be successful policy experts need to become familiar with the nature and experience of the science and technology that are shaping cities. They need to wield this science and technology with the same savvy as the scientists and engineers who discover and invent them.

54. Another example is the way that innovations in cities that promote public transportation and cycling could respond to climate change concerns. Tackling climate change in an integrated manner is one of the most critical drivers for STI. Therefore, it is crucial for this community to support and engage in the implementation of the outcomes of Cities IPCC Conference.

55. The rise of digital infrastructure and smart cities technology is providing public administrations new ways to monitor and respond to urban challenges and conditions as well as to contribute to the transformations required for achieving the SDGs. Smart cities involve infrastructure and the technology needed for its predictive maintenance. In this regard, data has become essential and has revolutionised our ability to monitor the physical infrastructure. The Forum noted several examples of smart cities initiatives and of policies to support member states in their efforts to achieve the SDGs in cities, including in

Argentina, Japan and by the International Atomic Energy Agency. While the first wave of smart cities had experienced some success, inspiring future approaches, continued progress would require the use of data in new ways and harness emerging technologies to enhance further developments. At the same time, algorithms should be transparent and open to criticism to ensure useful results.

STI for sustainable consumption and production patterns (Goal 12)

56. Decoupling economic growth from natural resource use is fundamental to sustainable development. A circular economy approach combined with modes of sustainable consumption and production could improve the sustainability and resilience of the whole global socio-economic system.

57. Food and agriculture are sectors that face enormous challenges concerning sustainable production and consumption. In developing countries, one-third of the produced food is lost in production and transportation, while in developed countries 40% of food is lost in retailing. Governments should promote evidence and science-based approach to reduce food loss and waste and implement policy innovations and reforms for sustainable and nutritious diets, including reforming subsidies as well as taxes on emission-intensive foods.

58. Micro and informal enterprises play an essential part of productive and consumption fabric, especially in developing countries. They have innovation and technology diffusion potential that should be taken into consideration in the promotion of STI for sustainable consumption and production. Efforts must target poor communities, scale up partnerships and promote science and technology through doing, using and acting.

59. The Forum noted examples such as Climate-KIC, a joint European climate innovation movement that addresses the climate innovation challenge to curb emissions collaboratively, looking at systematic innovation. Consumption and production pattern can also be made more sustainable by creating new efficiencies in existing models by crowd-based incentives or technologies like blockchain, or by creating new economic models such as shared access consumption or crowd-based capitalism.

60. It is critical to promote a change towards more sustainable consumption patterns and engage young people and children in this change. Participants also noted the importance of supporting bottom-up approaches, encouraging urban agriculture, introducing regulations, and examining the future of work and jobs concerning Goal 12.

STI for sustainable terrestrial ecosystems (Goal 15)

61. Biodiversity and ecosystems are essential for the survival of current and future generations. SDG 15 targets encompass various aspects of ‘life on land', ranging from freshwater and mountain ecosystems to biodiversity, desertification, land degradation and benefit sharing from genetic resources. The role of STI in achieving SDG 15 is related not just to those initiatives that directly relate to its targets, but also to those that can produce significant advances for other SDGs with limited additional impact on terrestrial ecosystems.

62. For example, agricultural and mining systems need restructuring and should become more sustainable as they are significant contributors to degradation of ecosystems and land and biodiversity loss. Small-scale food systems and landscapes could help to feed the world, as well as conserve biodiversity, local and indigenous knowledge and systems. In the mining sector, a priority area that has been identified is the development of mining and biodiversity guidelines for informing decision making.

63. Science and technology should be used to understand and learn from nature and to build capacity and infrastructure for the transfer of technology to grassroots level for immediate utilisation. Significant progress is possible through improving and scaling up existing technologies, including remote sensing for land use, planning and monitoring; locally applicable soil conservation methods; citizen science and community-based monitoring. Big data revolution can be

harnessed to monitor the state of health of natural capital, including through ecosystem accounting, transparently and accountable to decision-makers and stakeholders.

64. Increasing ecosystem resilience, ecosystem restoration and solving problems, such as drought and desertification need a people-centred approach and multi-stakeholder involvement. An especially important consideration is that of working with local communities, including indigenous peoples, to support how they may be applying local and indigenous knowledge towards attaining these targets.

65. Biodiversity is the living fabric of the planet, and its rapid decline threatens nature and people. The Forum stressed the need for bioethics and ethics in genetic technologies, such as changes in DNA that impact biodiversity, ecosystems and species. Regulation is needed to ensure responsibility and accountability for decisions regarding technologies that can have a potential adverse effect on humans and biodiversity.

Supporting the implementation of the Technology Facilitation Mechanism

66. Interest in and demand for the Technology Facilitation Mechanism and its components has continued to increase over the past year. The forum commended recent progress of the work of IATT and 10-Member Group.

67. In particular, the forum welcomed the launch of a prototype of the mandated TFM online platform which was presented during an IATT side event. Similarly, it welcomed the joint IATT capacity building initiative which has recently pooled STI-related training materials and expertise and organized an IATT training workshop in Amman, Jordan, in 15-19 April 2018.[4] Increased support is needed from donors and stakeholders, in order to have a fully operational online platform and to systematically close capacity development gaps. The online platform should become a main depository of STI knowledge, including with the support of the UN system.

68. Political and scientific leadership and adequate resources are essential. There were calls for longer-term funding for the Mechanism at a level that is commensurate with the goal of delivering on the expectations of Member States and other stakeholders. More broadly, funding for science, technology and innovation for the SDGs is crucial. At the same time, the existing funding landscape is highly diverse and fragmented.

69. The 2018 STI forum recognises that existing conferences and events in the UN system and beyond advance the objectives of the TFM, and that their inclusion strengthens the Forum. Outcomes of such events and related initiatives in support of the science-based, solution-oriented, multi-stakeholder and collaborative TFM were presented. It was also

[4] https://www.unescwa.org/events/workshop-innovation-policies-sdgs-arab-region

discussed how to optimise the TFM impacts and how to make TFM co-operations self-sustaining.

70. Appropriate arrangements should be made, so that stakeholders including global science communities and civil society can be further engaged in the planning and follow-up of the forum, building on institutionalised mechanisms and intersessional dialogue in online and offline formats.

71. The Mechanism's intersessional work should build links to and encompass important STI-related events and conferences, in order to amplify the scope of the forum and draw on diverse stakeholder communities, while also facilitating their interlinkages, synergies and mutual support. Examples include the GSS, GSTIC., ITU's AI for Good, and events on a broad range of STI issues with support of UNESCO, OECD and others. An IATT example is the Workshop on STI for SDGs (Incheon, 29 Nov to 1 Dec. 2017) which supported preparations for the forum. A thematic example is FAO's Symposium on Agricultural Innovation for Family Farmers (Rome, 21 to 23 November 2018) which aims to promote increased investments in family farmer friendly agricultural innovation and is envisioned as a direct contribution to the forum and the UN Decade of Family Farming.

72. It was requested to further expand IATT membership to include all relevant UN system entities and to consider pursuing partnerships with stakeholders and organisations mobilised by the 10-Member Group.

Stakeholders were also encouraged to make contributions to the IATT work streams, such as those on the online platform, on the STI for SDGs roadmaps, on assessment of the impacts of rapid technological change on the SDGs, and capacity building.

73. Despite deeper and more wide-spread cooperation among different actors of the STI community, there remains a lack of coordination and communication at national, regional and global levels. There are no central authorities, ministries or focal points that would support all technology deployment aspects. For joint action, numerous actors need to be brought together, and the roles of the UN, governments, development institutions, funding agencies, science academies, the private sector, civil society and other stakeholders need to be agreed in every country context.

74. Capacities need to be built not only for research and development and for specific technology solutions but most crucially for practical deployment of technology solutions at large scale, too. Similarly, technology management capacities are essential for identifying economically affordable, environmentally sound and socially acceptable new technologies.

75. Systems thinking and cross-sectoral cooperation is important for the identification of technological solutions for SDG implementation. One such example is wastewater treatment where traditionally an

expensive process could be turned into a resource for energy production and nutrients if right solutions are used.

76. Panellists suggested that Governments are not giving STI adequate focus in their SDG implementation, as evidenced by the lack of references to technology in the Voluntary National Reviews and the Nationally Determined Contributions reports.

77. Access to and equal benefits from new technologies are important. It was noted, for example, that reporting against 40 per cent of the SDG indicators could be dramatically improved through access to space technology. Space technology can be used for improving urban transport flows, tackling deforestation, measuring and mitigating climate change, and so on, but many countries are still not benefitting from these technologies and data. The issue of social acceptability of technologies also needs to be addressed.

Roundtable of STI innovators, funders and other supporters

78. The roundtable examined how to leverage frontier technologies, including by women and youth, to deliver impact investing and prosperity for all. It discussed ways to develop and pilot technology solutions for the SDGs, and to support the enabling policies that may be needed for taking these to scale. It also discussed the potential social impact of blockchain technology in achieving financial inclusion and preventing human trafficking.

79. The roundtable defined “impact investment” as an investment with both a social purpose and a financial return. It claimed that working towards the SDGs represented the largest business opportunity in the world.

80. Different businesses presented their work on STI for the SDGs. For example, the fin-tech fund, CreditEase, provides peer-to-peer lending and wealth management in China. Rakuten works in e-commerce and partners with small businesses. Incubate Fund makes investments in start-ups that service small consumer groups, such as seniors. Syneidesis is a family office that brings together deals on the scale of one to five million US$. Impact Leadership 21 educates people about the SDGs and the viability of impact investment. Rising Tide Capital supports entrepreneurial capacity building in economically depressed urban areas and communities in cities.

81. The roundtable recommended ways to make impact investing more attractive for investors; coupling with advisory services; gearing sustainable financial products to retail investors and make them more accessible; educating people, especially young people, about impact investment in sustainable businesses, and about technological changes; and working towards the financial inclusion of women.

Exhibition and young innovators

82. As an integral part of the forum, an exhibition hub was organized. This featured the winners of a global call for innovations as well as a showcase of corporate solutions for the Sustainable Development Goals, and a set of posters from research institutions. These innovations, selected from around the world, had to be transferable, inspiring and impactful.

83. The exhibition was launched through a special event. The innovations addressed technologies to improve water purification systems (SDG 6), promote cleaner cooking fuels (SDG 7), rethink urban waste management (SDG 11), and advance sustainable consumption and production by repurposing “ugly” fruits and vegetables that would otherwise be wasted (SDG 12), among others. Software company Qlik showcased the use of their data analytics for SDG tracking and smart city applications. National laboratories and other institutions presented themselves in the form of posters.

84. The following are short descriptions of the winners of the global call for innovations who pitched their solutions to the forum. The Jiko Raha innovation from Kenya is a fuel-efficient biomass stove enables households to have safe drinking water, insulates the stove and makes it more efficient.

85. The Inga Foundation’s alley-cropping is a scientifically-proven solution to stopping the devastation of tropical rainforests. It regenerates land and transforms the lives of subsistence farmers,

providing food security and organic cash crops, as well as reducing carbon dioxide emissions, protecting wildlife and marine habitats, and preserving water sources.

86. The Maji Mamas innovation enables women to build scalable water construction micro-franchises. They use interlocking stabilised soil block technology to make environmentally sustainable tanks for less than half the cost of the cheapest competitors on the market, increasing their income and bringing water management solutions to their communities. They receive training in business, leadership, and water and sanitation issues to build and expand on a scalable plan.

87. The Ocupa Tu Calle from Peru uses small-scale urban interventions to improve the quality of urban life, promoting the recovery of disused public spaces. It promotes collaboration between local governments, academic institutions, private sector and civil society; generates knowledge; and advises municipalities.

88. The ATEC* Biodigesters International produces, sells and distributes a commercially scalable biodigester that can reach all last-mile households. Utilizing animal, green and human waste, each system produces renewable biogas for daily cooking, 20 tons of organic fertiliser/year, and US$5,850 household savings over its lifetime.

89. The innovation from India on sustainable, effortless and low-cost drinking water systems are based on speciality polymer that removes virus, bacteria, turbidity, pathogens and iron without any chemical

treatment. It does not need any energy source or electricity to purify water. It has a long life and can be easily maintained.

90. The SweetSense innovation creates InternetofThings solutions to improve the quality and value of water, sanitation, and energy services in emerging markets. Groundwater sensors indicate runtime of each groundwater extraction pump, reporting daily over satellite or cellular networks to a central dashboard accessed by water service providers.

91. The City Based Common Hospital Waste Treatment facility from Nepal offers a solution for biomedical waste, prioritising the health and environment and focusing on non-burn technology and a city-based common treatment facility.

92. The FoPo Food Powder project from Philippines aims to re-engineer the future of food by turning $1 trillion worth of food waste into an opportunity. It has processed over seven tons of almost wasted fruits and vegetables, reducing CO_2 emissions and saving water.

93. The Education for Sharing initiative gives children between the ages six and 12 years a hands-on approach to science, technology, engineering, and math to make them accessible, relevant, and interesting. Through games and experiments, students learn about civic values and the SDGs.

94. The PetaBencana from Indonesia is a free web-based platform that produces megacity-scale visualisations of disasters in Indonesia using both crowdsourced reporting and government agency validations in real

time. It democratises decision support and increases the safety and resilience of cities.

Side event highlights

95. Stakeholders of the scientific and technological community in cooperation with Member States, international organisations, and other stakeholders organised 24 side events and some special events - the Global Solutions Summit, a G-STIC event - on a broad range of STI issues. Most of these events focused on questions regarding the role of science, technology and innovation in achieving SDGs; on energy, water, cities, biodiversity and climate change; or new technology advances in artificial intelligence, biotechnology or the fourth industrial revolution.

96. The Water Youth Network discussed local and indigenous knowledge. Urban Catalyst Lab highlighted case studies on best practices of stakeholders (e.g., IFRC, UNH, MIT Urban Risk Lab, the city of Atlanta, Microsoft) on the use of technologies to promote resilience. UNIDO and ITU addressed the 4th industrial revolution. IIASA, US NAE, ICSU, WFEO discussed pathways and a roadmap for transforming systems of energy, consumption and production, food and biosphere, cities, and new technologies for sustainable development ("The World in 2050 initiative"). Future Earth discussed STI solutions

in cities. MGCY discussed intergenerational capacity building solutions for the SDGs. Fair Air Coalition explored Earth System processes, planetary boundaries and circular economy ideas. UNESCO addressed collective efforts towards SDG15. ICSU and several African research institutions shared research experiences on sustainable urban development. ITU provided insights from the ICT community. STI and DRR communities came together to share innovative success stories to prevent disasters. UNESCO, K-water, W-smart, and the Government of the Republic of Korea showcased advanced technology applications for water conservation and improved services at lower distribution costs. The Stakeholder Forum for a Sustainable Future highlighted nexus technologies for smart, sustainable cities. IATT reported on its new joint capacity building programme and invited contributions to scale-up the initiative. OICT, DESA, WIPO, and UNFCCC presented a prototype of the TFM online platform and solicited comments and suggestions for its future development. The UN innovators network (UNIN) presented their work.

III. Key messages and general recommendations

97. 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 a multi-stakeholder approach was repeatedly underscored. The following issues stand out and are suggested for consideration by decision makers. The Forum also proposed a wide range of solutions and recommendations on how to address the challenges in the SDGs 6, 7, 11, 12 and 15, which are reported in section II above.

STI for the SDGs

98. Many insights have been gathered towards SDG specific solutions, including those that help to manage trade-offs and realize synergies. Attention should now move to addressing bottle-necks in their scaling up, dissemination and adoption. These should be discussed at the 2019 Forum with a view to informing the global follow up and review to be convened under the General Assembly in that year. A report capturing the way forward by the TFM would help guide member states in their deliberations that year.

99. The online platform, as mandated by the 2030 Agenda, is now at the stage where it could start delivering transformative results. Support from donors, the private sector, international organizations and others will be needed for this to happen, and the 2019 Forum should provide a venue to take stock of this. Similar results can be expected in relation to capacity building, STI for SDGs roadmaps, and the scale-up of indigenous/traditional knowledge.

100. The TFM is the multi-stakeholder platform in the UN system to advance STI applications for the SDGs. Existing conferences and events within and outside the UN might be associated with and consider presenting their STI summaries to the forum. Other initiatives, such as the LDC Technology Bank, are invited to connect in order to maximize their impact through Delivering-as-One.

Rapid technological change

101. Better knowledge and insights on the impacts of new technologies are needed – in both developed and developing countries - in order to prepare for the different scenarios of how these impacts might unfold in the coming years. These would include supporting the capacities of developing countries to assess and prepare for their impacts, including through the dissemination of public policies and good practices. The UN appears to be the proper global forum to deal with the topic.

102. Governments and all relevant stakeholders need to act proactively in the coming years, in order to realize the positive technology impacts and achieve the objective of the 2030 Agenda to ‘leave no one behind’.

103. Responsible and ethical deployment of technologies has to be balanced against concerns that “excessive” restraints on innovations which might otherwise deprive humanity of many benefits. This requires pragmatic, evidence-based ethical assessments that must derive from the values contained in the UN Charter, the Universal Declaration

of Human Rights, the Rio+20 outcome, and the 2030 Agenda on Sustainable Development.

104. Extraordinary levels of international cooperation on research, infrastructure, access, and capacities are needed, in order to overcome the technology gaps between and within countries, between men and women, and across social groups – ultimately to avoid long-run, low-technology traps. This requires multi-stakeholder approaches and UN system support.

105. Holistic, integrated approaches and strategies are needed. They should be conducive to a wide range of forms of knowledge and perspectives, including those of young people, as well as local, traditional and indigenous forms of knowledge, and also supported by new and emerging technologies.

106. In a rapidly changing world, a forward-looking perspective is needed to understand the potential opportunities and challenges associated with the impact of rapid technological change on the achievement of the SDGs, including through the engagement of other existing forums and opportunities, such as the HLPF and the General Assembly.

STI for SDGs roadmaps and action plans

107. The cross-cutting nature of STI and the SDGs requires holistic approaches and strategies. Multidisciplinary and integrated approaches

are necessary to take into account different sources of knowledge, including local and indigenous knowledge.

108. STI for SDGs roadmaps and action plans that aim to accelerate progress towards the SDGs need to be developed at national and sub-national levels, ideally with measures for tracking progress and in line with national and global development strategies. STI for SDGs roadmaps can be strategic tools for ensuring policy coherence and linking with solutions, public policies and good practices.

109. STI for SDGs roadmaps are most effective, if built up with stakeholder engagement in STI policy design, adaptation and application. Public-private partnerships and other forms of collaboration should be fostered with scientists and engineers in companies at the technology frontier. "Deep dives" are needed for each Goal for which roadmaps could help prioritise actions and promote cross-sectoral collaborations, as was illustrated by the forum's dedicated sessions on Goals 6, 7, 11, 12, and 15.

110. It was suggested that a group of Member States could lead the way by undertaking serious efforts over the next year to develop their own versions of such STI for SDGs roadmaps and reporting on their experiences at the HLPF in 2019.

Investment, Governments and the private sector

111. We need more engagement from science communities, funders, academia and private sector. Public-private partnerships are essential for STI, as are other efforts that expand partnerships with the private sector for creating business opportunities in pursuing science, technology and innovation solutions to the SDGs. Regardless of the model of involvement, a business case should be made for private sector investment in innovation for the Goals. Member States were also called upon to support the Technology Facilitation Mechanism, both politically and financially.

112. Strategies for fostering start-ups can be useful for crowdsourcing solutions to both economic and daily life challenges. In fact, existing technologies can solve many current needs, if matchmaking and scaling up can be facilitated, as was demonstrated in the forum's exhibitions and event on deploying, financing and scaling technologies. After its four-year cycle in 2019, the lessons learnt should inform the progress towards multi-year sustainable solutions.

IV. Recommendations for the multi-stakeholder forum on science, technology and innovation for the Sustainable Development Goals

113. Going forward, the Forum will continue strengthening its convening power for dialogues between stakeholders and governments and for sharing ideas and catalyzing new initiatives and partnerships. It will continue to help to identify practical means and solutions to foster STI in all countries.

Supporting an inclusive Technology Facilitation Mechanism

114. The high participation and engagement levels from a very diverse cross section of relevant parties showed that there is a real demand for the multi-stakeholder forum and its science-policy interface function in support of the SDGs. Given the high expectations for the TFM, Member States, and stakeholders should consider strengthening their political and financial support for the Mechanism.

115. The multi-stakeholder TFM should improve inclusion of stakeholders and associated related events, and improve coordination with UN system and international organizations. Support is needed for even greater participation in the forum from developing countries (e.g., government representatives and innovators) and the further development and operationalization of the Mechanism, including the full operationalization of the online platform, the joint IATT capacity building initiative, and the IATT subgroups work on STI for SDGs roadmaps and on rapid technology change and frontier technologies.

116. The forum should become more action-oriented and cumulative in its impact, including in the messages it provides to the high-level political forum. Over the coming 12 years, future forums should learn from and advance the achievements of previous ones. The forum should become the outcome of an annual programme of results-oriented activities and, as part of a series, provide a regular opportunity to collaboratively define priorities for action. The 10-Member Group and the Inter-Agency Task Team should further refine those objectives, develop specific actions and share progress of such actions to support those objectives. As proposed by the second forum, a roadmap for the Technology Facilitation Mechanism should be developed by the inter-agency task team and the 10-member group. The roadmap should also include details on associating key international events and meetings with the forum, in order to maximise the impact of the forum and to draw on key messages from different stakeholder communities.

TFM work on rapid technological change

117. The IATT subgroup work on rapid technology change and frontier technologies should disseminate information on and support the knowledge and understanding of STI trends, impacts, good practices, initiatives and public policies for the SDGs and their targets A forward-looking perspective, coherent and plausible scenarios, and more robust quantitative approaches can help in this effort. The IATT information paper on the subject could become a “living document” serving as entry

point to UN system, civil society, scientific and academic discussions on the topic.

118. The TFM should explore building partnerships and interfaces with universities, innovation incubators, and private sector entities that are at the forefront of this technological change. This could be in the form of a “SDG discovery lab” or a network of “STI for SDGs centres” that could serve as direct interface between the policy makers and technologists at the “frontier”, facilitating the exchange of real-time information, engagement, and policy insights.

TFM work on STI for SDGs roadmaps

119. The IATT subgroup work on STI for SDGs roadmaps and action plans is encouraged to support the development of multi-stakeholder STI action plans for implementing the SDGs. International support, Member State engagement, and partnerships with civil society and the private sector will be needed to develop capacities and to formulate STI for SDGs roadmaps at national and sub-national level and to fill the critical gaps in data, finance, and effective implementation. UN experts in the IATT, 10-Member Group and among TFM stakeholders constitute an important source of technical expertise in this respect.