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Discussions held during the twenty-second session of the Commission on Science and Technology for Development on the theme of the 2019 session of the Economic and Social Council, “Empowering people and ensuring inclusiveness and equality”

Note by the Secretary-General

The Secretary-General has the honour to transmit the summary by the Chair of the Commission on Science and Technology for Development of the Commission’s discussions at its twenty-second session, held in Geneva from 13 to 17 May, on the role of science, technology and innovation in empowering people and in ensuring inclusiveness and equality. The summary serves as the Commission’s contribution to the theme of the 2019 session of the Economic and Social Council, “Empowering people and ensuring inclusiveness and equality”.

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Summary by the Chair of the Commission on Science and Technology for Development of discussions held during the twenty-second session of the Commission on the theme of the 2019 session of the Economic and Social Council, “Empowering people and ensuring inclusiveness and equality”

1. The Commission on Science and Technology for Development held its twenty-second session in Geneva from 13 to 17 May 2019. During the session, the Commission considered two priority themes: (a) “The impact of rapid technological change on sustainable development”; and (b) “The role of science, technology and innovation in building resilient communities, including through the contribution of citizen science”. On 13 May, the Commission convened a high-level round table on the theme “The role of science, technology and innovation in empowering people and in ensuring inclusiveness and equality”. The Commission decided to submit the summary of the deliberations held during its twenty-second session to the Economic and Social Council as a substantive contribution for consideration during the Council’s high-level segment, to be held in July 2019.

2. The Commission examined some critical normative issues to orient science, technology and innovation towards inclusive and sustainable development. Participants highlighted that science, technology and innovation could empower people, including the poor and most vulnerable, by facilitating education and the development of job skills, connecting people and communities and giving access to information and knowledge. Inclusive innovation and new technologies, such as artificial intelligence, big data, the Internet of things, and satellite and drone technologies, could make a powerful contribution to inclusive and sustainable development. Those technologies had also raised concerns, however, about increasing inequalities between and within countries, especially between those that had and did not have access to them. Against that backdrop, Governments in collaboration with civil society, business and academia should make strategic efforts to create an environment for harnessing frontier technologies to ensure that no one is left behind. The dividends of technological advancements would remain limited without appropriate rules, policies and conducive environments at all levels. Reaping the full potential of science, technology and innovation required active intervention by Governments with the engagement of all stakeholders and appropriate international support and cooperation.

Role of science, technology and innovation in empowering people and in ensuring inclusiveness and equality

3. Participants emphasized that science, technology and innovation played an essential role in empowering people and in ensuring inclusiveness and equality. Representatives of many Member and observer States, including the following, shared their experiences in using science, technology and innovation for promoting the achievement of the Sustainable Development Goals and leaving no one behind: Angola, Armenia, Austria, Belgium, Botswana, Bulgaria, Cuba, the Dominican Republic, Germany, Iran (Islamic Republic of), Nepal, Nigeria, Pakistan, the Philippines, Romania, South Africa, Sri Lanka, Switzerland, Thailand, Uganda, the United States of America, Zambia and the State of Palestine, as well as the European Union,.

4. In that regard, participants highlighted the important role of inclusive and mission-oriented science, technology and innovation policies and initiatives for the Goals, and they noted several examples. Botswana was promoting the integration of

science and technology into all sectors of the economy to foster inclusive economic growth and diversification. Bulgaria had incorporated policy guidance related to information and communication technologies (ICT) into several national strategies such as health strategy, public administration strategy and strategy for the effective implementation of ICT in education and science. In the Islamic Republic of Iran, the domestic capability to produce medicine had dramatically reduced the cost of health care and had enabled health services to be provided to almost all citizens. In the Philippines, the Philippine development plan, 2017–2022, included a chapter on vigorously advancing science, technology and innovation to enhance the social fabric, reduce inequality and increase potential growth. In Nigeria, the Federal Ministry of Science and Technology had started the revision of the national science, technology and innovation policy to strengthen further the role of science, technology and innovation in creating jobs and wealth, reducing poverty and building a safe and prosperous nation. In a draft policy on science, technology and innovation, Nepal had recommended recognizing the knowledge carriers and practitioners of Dalit, and marginalized and indigenous communities by providing technical diplomas equivalent to formal degrees, which would give a sense of equality and provide opportunities to enhance their capabilities. In Sri Lanka, the Goals were being redefined in terms of science, technology and innovation interventions that made the Goals achievable. The Ugandan national development frameworks had highlighted the strategic role of scientific innovation in uplifting other sectors of the economy for inclusive and sustainable development. The science, technology and innovation policy review process that had been conducted in Thailand by the United Nations Conference on Trade and Development (UNCTAD) and had concluded in 2014, played an essential role in developing inclusive science, technology and innovation policies in the country and in placing innovation as the central theme for the country's national development plan. In Zambia, science, technology and innovation policies were aligned with the seventh national development plan for the period 2017–2021, under the theme "Accelerating development efforts towards the Vision 2030 without leaving anyone behind".

5. Participants noted with concern the persistent digital divide that nearly half of the world's population was still not using the Internet. There were gaps in coverage, speed and affordability, and gaps between developing and developed countries, between cities and villages, and between men and women online. In that connection, participants highlighted the importance of ensuring inclusiveness and equality in access to science, technology and innovation infrastructure, including higher education systems, ICT infrastructure, research and development, and innovation centres. Participants noted several relevant initiatives. For example, Botswana had invested in the development of science, technology and innovation infrastructure and in setting up research and innovation institutions, whose strategic plans were developed through consultations with various communities and stakeholder groups. In the Islamic Republic of Iran, the higher education system had more than 4 million university students, of whom about 50 per cent were women. Universities, science parks and other science, technology and innovation infrastructures had been established in all provinces of the country, broadband Internet services were available in almost all rural areas and the Government had invested in providing ICT services to underserved citizens. In the Philippines, science and technology scholarships and research and development funding struck a balance between excellence and equity, ensuring that opportunity was maximized across the country. The Government had increased scholarships by a factor of 10 in the previous 10 years and had funded research and development in universities in the countryside for economically relevant products and services. In Uganda, the Government had liberalized the airwaves and made the Internet more affordable to all segments of society. In Thailand, the Government had launched the Village Broadband Internet Net Pracharat project,

which had expanded high-speed Internet access to all 24,700 rural villages in the country, and had included the installation of free public Wi-Fi hotspots in public areas in rural villages such as schools, hospitals and village centres.

6. Participants highlighted the critical role played by social innovation in ensuring inclusiveness and equality. In the Islamic Republic of Iran, for example, science, technology and innovation policy frameworks and instruments promoted social innovation by supporting vibrant domestic entrepreneurship ecosystems, with a focal role for start-ups that fulfilled the needs of persons with disabilities, the poor, women and children, residents of deprived areas, addicts, homeless people and people in prison. In the Philippines, previously unemployed rural workers were trained for jobs in the online freelancing industry to work in digital advertising, graphic design and other digital jobs. Participants also noted the importance of building human capital, and productive and technological capabilities, including in marginalized communities. In Thailand, the Ministry of Digital Economy and Society had created curricula on Internet fundamentals, ,career development and income growth, which had been used to train over 1 million people in rural villages across the country.

Applying a gender lens to science, technology and innovation

7. Participants noted the need to strengthen the voice, participation and leadership of women and girls as consumers and producers of science and technology for the implementation of the 2030 Agenda for Sustainable Development and to ensure that no one is left behind. They emphasized the necessity of taking ender perspectives into consideration in the context of science, technology and innovation if significant progress were to be achieved for all. The energy, dynamism and diverse perspectives of women and men needed to be reflected in science, technology and innovation. Participants discussed viewing science, technology and innovation from a gender perspective, including with regard to the need to consider gender perspectives in addressing any aspect of development; to address multiple and intersecting forms of discrimination so that all women and girls could benefit from science, technology and innovation and inequality would not be perpetuated; to take into account women's participation in science, technology and innovation relative to men's participation and the representational issues that consequently affected women's incomes; to promote the right of women to participate fully in science, technology and innovation and address the related challenges they faced in the context of development; to address the widening digital gender divide, which limited educational opportunities and access to jobs for women and girls; and to recognize the "gender lens" as a means through which to review and transform existing science, technology and innovation systems and to design of new systems, processes, policies and practices.

8. Participants noted several examples of encouraging policies and advances in promoting gender equality in science, technology and innovation. For example, Bulgaria ranked first in Europe in terms of the number of women working in the information technology sector (27 per cent compared with an average of 17.2 per cent for the European Union), and in terms of the fact that 53 per cent of the country's scientists and engineers were women. In 2018, during the Bulgarian presidency of the Council of the European Union, Bulgaria had launched a European network of women leaders in the digital industry to provide better visibility to women leaders in technology and the digital economy. In Nepal, at least 40 per cent of the 36,000 officials at local, provincial and federal parliaments were women, with proportionate representations from all communities, including those who were socially deprived. Gender and inclusion strategies were in place to provide equal access to resources and services for women and the poor and marginalized at all levels. In the Philippines, the Magna Carta for Women of 2009 included the provision that all government agencies must perform gender and development planning and budgeting, using no less

than 5 per cent of the agency budget. The percentage of female research and development project leaders in the country was 44 per cent, and all research and development products were required to be gender-sensitive and easy to use for both women and men.

9. Participants noted some of the actions that facilitated and contributed to the application of a gender lens to science, technology and innovation. They highlighted the need to support girls and women in diversifying their educational and occupational choices and encourage them to enter emerging fields and growing economic sectors, such as science, technology, engineering and mathematics, statistics and ICT. In that regard, participants noted that the International Girls in ICT Day took place every fourth Thursday in April to encourage more girls and young women to take up ICT careers and studies. Other actions to apply a gender lens to science, technology and innovation included: collecting, analysing and disseminating more and better disaggregated data on women's and girls' participation in education and careers related to science, technology, engineering and mathematics, and using such data to inform better and more targeted policies; ensuring that gender analysis was undertaken and disaggregated data was used from the outset in the design of policy instruments, research projects and products; and making sure that science, technology and innovation responded to gender-specific needs and actively contributed to preventing and eliminating discrimination and inequalities.

Role of science, technology and innovation in building resilient communities, including through the contribution of citizen science

10. Participants noted that social, economic and environmental shocks affected disproportionately the most vulnerable and could perpetuate disparities. Therefore, building resilience was essential for inclusive and sustainable development. In that connection, science, technology and innovation had a critical role to play. Digital technologies had empowered and given a voice to people during crises, and those technologies were critical to assessing, monitoring and managing risk and in responding to emergencies. Innovation was key for economic diversification, which increased the ability of economies to adapt to shocks and sustain jobs. New technologies facilitated access to energy and had enabled financial inclusion and risk financing. They were also used for resource management and held the promise of decoupling economic development from environmental degradation, promoting environmental sustainability.

11. Participants noted projects and programmes that harnessed science, technology and innovation in the context of resilience. For example, in Botswana, projects and programmes were being implemented to develop decision-related support systems to reduce the impact of climate change on smallholder arable farmers by strengthening their adaptive capacity for resilience-building. In yet another initiative, small and medium-sized enterprises had been engaged in assessing the economic impact of El Niño-related drought on their operations.

12. Participants also noted that it was important to make science, technology and innovation more participatory and inclusive and to increase public engagement in science and technological development. In that connection, citizen science, which used new technologies, particularly the mobile Internet, to engage volunteers in carrying out tasks such as data collection in support of scientific explorations, could serve to involve and empower people and communities that might otherwise be bypassed in more traditional ways of to generating knowledge. The importance of indigenous or traditional knowledge was also highlighted.

Impact of rapid technological change on inclusive and sustainable development

13. Participants noted many examples of how rapid technological change could contribute to inclusive and sustainable development. They also noted the strategies, policies and institutions that countries had implemented and established to participate in the fast-growing and very dynamic field of new technologies. For example, at the end of 2018, the Government of Bulgaria had approved additional measures and resources for the development of national scientific programmes on such topics as "Information and communication technologies for a single digital market in science, education and security", "Low carbon energy for transport and welfare", "Healthy food for a strong bioeconomy and quality of life", and "E-Health in Bulgaria". In Nigeria, Presidential Executive Order 5 to improve local content in public procurement, with science, engineering and technology components provided for the creation of science and technology centres to increase the capacity of firms to compete in the international market. Nigeria had established a national biotechnology and development agency and a national agency for science and engineering infrastructure, and was establishing a national agency for research in robotics and artificial intelligence. In Sri Lanka, the "Shilpa Sena" programme of the Ministry of Science, Technology and Research had combined emerging technologies, and science, technology, engineering and mathematics education, careers and entrepreneurship as a way of enhancing technology literacy in the country. The focus of the programme was on nanotechnology, biotechnology, neurotechnology, 5G and the Internet of things, personalized medicine, blue-green technologies, new energy, robotics and industrial automation, mechatronics, artificial intelligence and space technology. To ensure the diffusion of scientific literacy to grass-roots levels and technology transfer, the Ministry was taking steps to transform the country's network of science and technology centres, known as Vidatha resource centres, into technology transfer offices with close ties to research and development institutions. The country had a state-of-the-art nanotechnology laboratory, which had been launched in 2013 and included a technology incubator centre and a hi-tech greenhouse. The Government was planning the establishment of a biotechnology innovation park, and was building a science centre. The Ministry had prepared a national research and development framework identifying 10 priority areas for research and 10 interventions. Sri Lanka had a nanosatellite in the International Space Station that would be launched into orbit. In Uganda, the development of mobile apps was spawning a new generation of technological entrepreneurs searching for innovative ways to connect various sectors with their respective customers. Numerous applications were being created to help bridge the infrastructure deficits while helping to meet the aspirations of an increasingly tech-savvy Ugandan population. The review of the science, technology and innovation policy, which was being conducted by UNCTAD, was expected to increase the Government's capacity to shape technological trajectories and for the country to position itself as a regional leader in science, technology and innovation.

14. Participants also noted concerns regarding the potential of new technologies to trigger new areas of inequality or increase existing inequalities. While the application of those technologies brought enormous opportunities to address the Goals, they also posed new challenges, as they could disrupt economic development, exacerbate social divides and raise ethical questions. To address those challenges, the international community needed to advance its understanding of the risks and benefits and ways to manage frontier technologies so that no one is left behind. Developing countries, especially the least developed countries, that were not engaged in the development of frontier technologies but were likely to be affected by their consequences, needed to be part of that international debate. It was important to have an open and inclusive debate with all stakeholders on these issues.

15. Participants discussed the potential of artificial intelligence to contribute to sustainable development. Examples included the importance of artificial intelligence for smart manufacturing and Industry 4.0, employment generation, sustainable energy, mobility and transport, health, remote sensing and Earth observation, the blue economy, environmental sustainability and biodiversity. Participants noted that many countries had developed or were developing national policies and strategies on artificial intelligence, with significant financial investments, including in research and development, technology development, and industrial applications. Participants also noted a few lessons learned from the variety of policy experiences. Some countries were using the artificial intelligence policy development exercises to understand the possible implication of artificial intelligence, among other frontier technologies, on the Goals and their national development agendas. Several countries were engaging in a broad-based, participatory dialogue involving a range of stakeholders, including academia, research institutions, the private sector, government and civil society, to help to set priorities in their respective economies. Some countries had made normative concerns a key part of their strategies, with a focus on easing potential labour market disruptions owing to automation, addressing data-related concerns of privacy and security, investigating issues involving bias and discrimination embedded in digital algorithms and promoting diversity and inclusion in education, research and industry related to artificial intelligence. Some countries were developing their national artificial intelligence strategies in consultation with regional bodies to establish common areas of policy concern and coordination.

16. Participants raised the concern that productive and technological capabilities in the African region remained low. Countries in Africa needed to develop their infrastructure and provide training in the requisite skills so that Africans could contribute to and take full advantage of the new technologies. Developing national strategies for rapid technological change, which included artificial intelligence, required a comprehensive analysis of the infrastructure on the ground, the policy framework, the availability of skills, the enabling environment and finances. A country's success in the diffusion of rapid technological change depended on its ability to strengthen the national innovation system, build capacity, strengthen the interlinkages between all stakeholders in the system to respond to emerging technological trends and create an enabling economic and legal environment.

Partnerships and international cooperation

17. Participants emphasized the importance of international and regional cooperation on science, technology and innovation with regard to making knowledge accessible, sharing experiences and learning from each other and ensuring that no one is left behind. They also stressed the importance of strengthening bilateral regional and multilateral cooperation on science, technology and innovation, solution-oriented research and scientific, technological, digital, statistical and research capacities. The worldwide and cross-sector mobility of researchers and access to publicly-funded and open-access publications to facilitate knowledge circulation should be promoted. North-South, South-South and triangular cooperation were needed, in particular for the least developed countries, to facilitate the development of and access to vital and environmentally sound technologies.

18. Participants noted the importance of regional cooperation in promoting the diffusion of inclusive and development-oriented technologies. For example, African Heads of State and decision makers, through the Agenda 2063 of the African Union, had highlighted science, technology and innovation as key enablers in promoting the ability of African countries to achieve their economic transformation and socioeconomic development goals. In 2018, the African Union High-level Panel on Emerging Technologies and the Planning and Coordination Agency of the New

Partnership for Africa's Development Agency had launched a forum for dialogue on innovation and emerging technologies to develop a culture of science and technology among Africans, investigate emerging technologies to be embraced by the continent and look into regulatory aspects so that Africa could lead rather than follow the development of new technologies. The High-level Panel selected 10 emerging technologies to be analysed for Africa: gene drive technology; microgrids; drones; precision agriculture; water purification; next-generation medicines; next-generation batteries; synthetic biology; artificial intelligence; and three-dimensional printing and manufacturing. Analyses had been conducted for the application of gene drives for malaria vector control and elimination; the application of drone technology for transforming agriculture in Africa and for contributing towards improving health and the well-being of communities; and the promotion of microgrids for expanding access by African countries to energy. Additional technologies to be analysed were: artificial intelligence; next-generation batteries for addressing energy challenges; and blockchain technology. Participants also noted that the European Union and its member States were very active in international cooperation in research and innovation and supported sustainable development in Europe and globally, notably through the Horizon 2020 European Union framework programme for research and innovation as well as the development cooperation instruments of the European Union. Common interests and mutual benefits were key aspects of the European Union's global commitment to the co-creation of solutions, as well as knowledge sharing for sustainable development.

19. Participants noted several examples of development cooperation on science, technology and innovation for inclusive and sustainable development. For example, Bulgaria was developing 42 projects in the Western Balkan countries and the Eastern Partnership at a total cost of lev 3.5 million, including projects aimed at improving the quality of education and protecting the rights of disadvantaged children and children with disabilities, providing support to combat violence against women and girls in Yemen and providing humanitarian assistance in the Syrian Arab Republic. Nigeria hosted the fifth high-level industry, science and government dialogue on Atlantic interactions from 28 to 30 April 2019, which provided a platform for sharing and discussing ideas and the best approaches to the joint study of the Atlantic Ocean for the benefit of humanity. The Philippines shared with the States members of the Association of Southeast Asian Nations remote sensing technologies for disaster risk reduction through hazard mapping, and technologies related to genomics for climate change resilience to develop varieties that were climate resilient.

20. Participants noted several United Nations initiatives and programmes in support of the use of science, technology and innovation for the Goals. For example, the UNCTAD programme of science, technology and innovation policy reviews built stronger national capacities in science, technology and innovation, assessed national innovation systems and priority sectors and industries and provided recommendations to improve technological capabilities and foster innovation, and to use a multi-stakeholder approach to building a national consensus on science, technology and innovation policies. The inclusion of the Goals in the reviews was another welcome development. Similarly, the inter-agency task team of the Technology Facilitation Mechanism was promoting science, technology and innovation for roadmaps to accelerate the achievement of the Goals. The International Telecommunication Union (ITU) and the United Nations Entity for Gender Equality and the Empowerment of Women (UN-Women), in collaboration with the African Union Commission, had launched the "African Girls Can Code" initiative that was aimed at training and empowering girls in primary and secondary school and young women between 17 and 20 years of age across Africa to become computer programmers, creators and designers. The objective of the Global Partnership for Gender Equality in the Digital Age was to establish a network of organizations to

ensure that women and girls had access to, and developed the necessary skills and leadership potential for, work in the ICT industry.

21. Participants also noted that, in the statement of the 10-year review of the World Summit on the implementation of World Summit outcomes and in the vision of the 10-year review of the World Summit beyond 2015, Member States invited all Summit stakeholders to mainstream a gender equality perspective and use ICT as a tool to that end. ITU, UNCTAD, the United Nations Development Progrmame and the United Nations Educational, Scientific and Cultural Organization (UNESCO) had been working with focal points of the United Nations World Summit on the Information Society action lines to fully integrate gender equality perspectives in strategies related to the Summit, including the Summit's annual forum. The Broadband Commission's working group on the digital gender divide, chaired by GSMA and UNESCO, had delivered a set of recommendations in March 2017, to help to reduce the digital gender gap in Internet and broadband access and to clarify the complementary roles of different actors.

22. Given the potential benefits and risks of rapid technological change, international mechanisms and platforms were needed to understand better how frontier technologies were evolving and assess their impact on economies, societies and the environment. It was essential that the technological assessments take into consideration the supranational implications of technologies, involve multiple stakeholders and assist national policymakers in developed and developing countries in enhancing their capacities to make sense of rapid technological change.

Commission on Science and Technology for Development

23. Participants reaffirmed the critical role of the Commission in promoting science, technology and innovation for development. They encouraged the Commission to continue to articulate the critical role of science, technology and innovation in facilitating achievement of the Goals and to inform and advise the Economic and Social Council, the General Assembly, the high-level political forum on sustainable development and other relevant forums. They also called on the Commission to provide a forum for strategic planning, sharing lessons learned and best practices, providing foresight about critical trends in science, technology and innovation in key sectors of the economy, the environment and society, drawing attention to emerging and disruptive technologies, and providing a space to discuss hard, practical and normative questions about science, technology and innovation, where novel collaborations could emerge between the Member States, academia, civil society and the business community engaged in science and technology for development.

24. Participants welcomed the collaboration and exchange of views between the Commission on Science and Technology for Development and the Commission on the Status of Women. Those efforts strengthened policy coherence and alignments in the pursuit of the common objective of contributing to the follow-up to the 2030 Agenda and the implementation of the Goals. Participants encouraged the Commission on Science and Technology for Development to continue to collaborate with the Commission on the Status of Women to advance gender equality and the empowerment of women and girls through science, technology and innovation. In that regard, participants encouraged the Commission on Science and Technology for Development to play a role in gender equality in the digital society, by considering how women and girls could benefit and contribute to science, technology and innovation, including by expanding their access to ICT, supporting the increasing participation of women in jobs related to science, technology, engineering and mathematics, and promoting cybersafety. Participants also encouraged the Commission to prepare a list of 50 challenges for women and girls that urgently need

technological solutions, to serve as a guiding tool for fostering gender-sensitive innovation.

25. Participants encouraged the Commission to consider the provision of training programmes for policymakers in topics related to technological change, including supporting countries to conduct foresight on ICT trends as well as capacity-building efforts to use and deploy technologies in developing countries, predominantly in the least developed countries. UNCTAD was also working with the Government of China to provide short training programmes in China for academics from developing countries. Participants further noted that, as the secretariat of the Commission, UNCTAD was already working on those issues through its work on the science, technology and innovation policy reviews.

26. Participants commended the Commission for continuing to be a leading voice in advocating technological foresight in science, technology and innovation policy. They also encouraged the Commission to engage in a joint reflection about the policy responses needed and the common values that should underpin those policies in order to benefit from the opportunities and address the challenges of rapid technological change for sustainable development. In that regard, new technologies, such as artificial intelligence, should continue to be discussed in influential forums like the Commission to increase understanding of the impact of those technologies.