THE PRESIDENT
OF THE
GENERAL ASSEMBLY

6 August 2018

Excellency,

Upon the request of H.E. Ms. Marie Chatardová, seventy-third President of the Economic and Social Council, I have the honour to transmit to you the summary of the discussions of the Commission on Science and Technology for Development on the theme "Impact of rapid technological change on the achievement of the Sustainable Development Goals".

Please accept, Excellency, the assurances of my highest consideration.

Miroslav Lajčák

All Permanent Representatives and
Permanent Observers to the United Nations
New York

The President
of the
Economic and Social Council

25 July 2018

Excellency,

I have the honour to transmit a letter from the Chair of the twenty-first session of the Commission on Science and Technology for Development enclosing the summary of the discussions held during the session of the Commission on the theme "Impact of rapid technological change on the achievement of the Sustainable Development Goals". The Chair of the Commission has requested that the summary be forwarded to you for circulation to all Permanent Representatives and Permanent Observers to the United Nations.

Please accept, Excellency, the assurances of my highest consideration.

Sincerely,

Marie Chatardová
President of the Economic
and Social Council

His Excellency Mr. Miroslav Lajčák
President of the seventy-second session
of the General Assembly

6 July 2018

Excellency,

With reference to operative paragraph 2 of General Assembly 72/242, in which the Assembly requested the Commission on Science and Technology for Development, through the Economic and Social Council, to give due consideration to the impact of key rapid technological changes on the achievement of the Sustainable Development Goals, I have the honour to transmit herewith the summary of the discussions held during the twentieth-first session of the Commission on the theme "Impact of rapid technological change on the achievement of the Sustainable Development Goals". It will be appreciated if the summary could be transmitted to the President of the General Assembly for circulation to all Permanent Representatives and Permanent Observers to the United Nations.

Please accept, Excellency, the assurances of my highest consideration.

Plácido Gómez
Chair of the twenty-first session of the
Commission on Science and Technology for
Development

H.E. Mrs. Marie Chatardová,
Permanent Representative of Czech Republic to the United Nations
President of the Economic and Social Council

Summary by the Chair of the discussions held during the twentieth-first session of the Commission on Science and Technology for Development on the "Impact of rapid technological change on the achievement of the SDGs."

1. The Commission on Science and Technology for Development (CSTD) held its twentieth-first session in Geneva from 14 to 18 May 2018. During the session, on 15 and 16 May, the Commission considered two priority themes: (a) "Building digital competencies to benefit from existing and emerging technologies with a special focus on gender and youth dimensions"; and (b) "The role of science, technology and innovation in increasing substantially the share of renewable energy by 2030". On 14 May, the Commission convened two high-level roundtables; one on the theme "The role of science, technology and innovation in supporting sustainable and resilient societies" and the other on the "Impact of rapid technological change on the achievement of the Sustainable Development Goals". The latter was in response to General Assembly resolution A/RES/72/242 on the "Impact of rapid technological change on the achievement of the Sustainable Development Goals", which mandated the CSTD to give due consideration to this theme. The Commission decided to submit the summary of the deliberations on that theme held during its twentieth-first session to the General Assembly.

2. The Commission examined critical issues related to recent technological advances, especially those driven by the rapid development of digital technologies. Participants recognised that the fast pace in science, technology and innovation (STI) offers new opportunities for economic prosperity, social inclusion, and environmental sustainability, and can help to achieve the sustainable development goals (SDGs). At the same time, rapid technological change is likely to outpace the ability of societies to adapt and manage its social, economic and environmental effects, posing complex challenges for public policy. Participants have raised concerns with respect to employment, inequality and ethics. Technological change and innovation should be directed towards inclusive and sustainable outcomes through strategic efforts by governments in collaboration with civil society, business and academia.

3. Participants expressed appreciation for UNCTAD's Technology and Innovation Report 2018 on the theme "Harnessing frontier technologies for sustainable development". The report calls for an international dialogue to develop policy responses to the serious ethical, environmental, economic and social questions raised by frontier technologies. The Report also identifies the CSTD as a key forum for such dialogue.

Features and potential of frontier technologies

4. Participants noted that rapid technological change is driven by: the cumulative nature of technology development; the accelerated rate of improvements in technologies; their convergence facilitated by the emergence of digital platforms such as the Internet; and reductions in costs of the technologies and declining entry costs for innovators. The reduction of costs helps to easy access to these technologies allowing a larger number of people to exercise their creativity and innovate.

5. Several technologies show significant potential to enable the achievement of the SDGs with applications in many areas, including industry, healthcare, agriculture, forestry, energy, transport, and water. Big data analysis can help to address critical global issues, create scientific breakthroughs, advance human health and improve decision-making. The Internet of Things allows connected objects and machines to be monitored and managed. Artificial intelligence (AI), particularly combined with robotics, could transform production and business, especially in manufacturing. 3D printing allows faster and cheaper low-volume production and rapid iterative prototyping of new products. Biotechnology enables gene editing, making possible

personalised treatments and genetic modification of plants and animals, potentially revolutionising agriculture and the management of epidemics. Nanotechnology is used in water purification, battery storage, precise management of agrochemicals, and in the delivery of medication, among others. Renewable energy technologies provide electricity in rural areas far from the grid systems. Self-driving cars could transform the movement of people and the use of space in cities. Drones could revolutionise the delivery of supplies, facilitate protection and restoration and promotion of sustainable use of terrestrial ecosystem, and replace humans in dangerous tasks. Small-scale satellites will soon be affordable for more developing countries, businesses and universities with potential applications for improving agriculture and food security, and medical access in rural areas, among others.

6. Participants reported on their strategies to harness STI, including to develop and adapt emerging technologies. For example, Angola has supported economic diversification through STI, increased the number of researchers in science, technology, engineering and math (STEM); developed science and technology parks, and established a national system for training methods in STI. Botswana has revised the STI policy to turn the country into a knowledge-driven society instead of driven by raw materials. Ghana has initiated a review of its national STI policy with emphasis on space science, nanotechnology, green technology and big data science. It has placed STI at the centre of its development agenda themed "Ghana Beyond Aid" and initiated a review of national STI policy, established a national advisory council, a national research fund, an innovation and research commercialisation centre, a National High-Performance Computing Center, and the Ghana Radio Astronomy Observatory. Pakistan has a long-term vision and strategy for its socio-economic development named Vision 2025, and the STI Policy 2012 recognises that investment in human resources and development of science and technology infrastructure are critical elements to address the rapid technological change. Poland has passed new ICT regulation to protect consumer interests, developed infrastructure and services, including 5G, fostered competition in the ICT sector, promoted a paperless and eco-friendly society and business, and developed digital competencies for children and youth. In Sri Lanka, special focus has been given to developing and adapting emerging technologies such as biotechnology, nanotechnology, robotics, and artificial intelligence. The Government has promoted demand-driven research and innovation-focused industry-research links and creating an enabling environment by supporting financially and technically technology-oriented entrepreneurship. Swaziland's 2020 vision provides a roadmap to encourage the development of STI in the country. Switzerland's national strategy "digital Switzerland" includes the roll-out of broadband internet to reach excluded populations. Zambia has made significant policy changes in science, research and skills development, and in improving connectivity, promoting incubation centres and innovation hubs.

7. Participants also noted the methodology "Space Enabled Design Cycle" developed by the MIT Lab and its collaboration with entrepreneurs in developing countries in designing small-scale satellites, for example as in the work with the Green Keeper Africa, in Cotonou, Benin, to use satellite imaging to find best harvesting spots.

Implications for employment, inequality and ethics

8. Participants noted that the pace of technological change is faster than that of political decision-making and its implementation. As the gap between the two widens, serious and multiple questions arise in matters of ethics, governance, equality and equity to which society must answer.

9. For example, frontier technologies such as AI can eliminate some jobs while creating others. Although the net effect remains uncertain, there are signs of polarisation of jobs and unfavourable impact on women in developed and developing countries. In lower-income countries that have large populations, especially those facing youth bulge conditions, lack of employment opportunities or displacement of

labour could aggravate poverty leading to marginalisation, disparities and conflict. Many developed countries have safety nets such as unemployment benefits, which developing countries are unable to afford.

10. For most developing countries, the net effects of frontier technologies on employment are likely to depend on the economic feasibility of the introduction of these technologies in the country's context, the structure of each country's economy, and their existing and potential prospects for trade specialisation. Participants stressed the need to counteract trends that contribute to increasing inequality within and between countries, further hampering the prospects of developing countries to catch up.

11. Emerging technologies and technological convergence also give rise to issues of citizen's rights, privacy, data ownership and online security. For example, AI systems and algorithms could reproduce biases such as gender and racial stereotypes, or amplify the discriminations appearing in the data on which these systems are based.

12. Biotechnology combined with big data science produces vast amounts of data in the DNA sequencing process. These data are curated in a decentralised way, and access in clinical medicine has been increasingly regulated. A concern pertains to the lack of diversity with respect to data source. Most of the participants in genome-wide association studies are of European ancestry.

13. Participants encouraged governments to adopt institutional frameworks and regulatory regimes for data collection, use and access, and for data privacy and security, balancing individual and collective rights, and allowing private sector innovation while taking into consideration the potential for concentration of market power in digital technologies.

14. Participants also noted the need to solve the ethical and safety dilemmas of genetic manipulation, and to have better mechanisms for identifying health hazards from emerging technologies, especially since most developing countries do not have the capacity to make comprehensive risk assessments. They also noted the importance of linking traditional knowledge with the new insights from modern science to allow the benefits of the use of this knowledge to return to their traditional owners, as in the case of traditional medicine.

Critical role of digital competencies and complementary skills to benefit from rapid technological change

15. Participants noted that digital skills would be essential in many of the occupational categories in the coming decades. Digital literacy for all is a critical requirement to enable every citizen to participate fully in the digital society. Many of the advanced technologies are designed for use in contexts where infrastructure and natural and social resources differ from those in developing economies. Therefore, to maximise the benefits of new technologies, countries and companies in developing countries need to have the skills to introduce modifications to them.

16. Participants shared their experiences incorporating digital competencies in the education system. It was noted that education policies should emphasise the importance of digital competencies at all levels - the primary, secondary and higher education. Training should be available to both students and teachers. For instance, Bolivia provided ICT training to more than 200,000 teachers between 2010 and 2015. Bulgaria has developed the Digital Bulgaria 2020 Programme, a strategy that has as one of its objectives to overcome the digital divide by enhancing digital literacy and stimulating the broad adoption and use of ICT by citizens, businesses and the public sector. It is important to note that training needs to be flexible since emerging technologies are continually changing as well as the demand for digital skills, which also underscores the importance of lifelong training. The Government had recently published the Digital Bulgaria 2025 programme, which prioritises the increase of digital competencies and skills and envisages the introduction of computer modelling

as a new subject in primary school. Poland has implemented projects to develop skills and awareness among youth and the elderly. For example, the "Coding with UKE" campaign focus on supporting the development of digital competencies among the youth through subjects such as coding with SCRATCH language, Smart City programming, robotics, and 3D design. Other campaigns are "I know what I'm signing", which is directed specially to advise the elderly on how to conclude contracts, and "I Click Sensibly", which focuses on teaching children how to surf online and use telecommunication devices safely, including dealing with online aggression and protecting personal data. Outside the formal education classroom setting, vocational training has the potential to help young people seize opportunities in the labour market. Turkey, through its Industry 4.0 project, has set up vocational schools dedicated to providing young students with training in digital skills and familiarise them with emerging technologies.

17. However, digital skills are not enough to adapt to the changing labour markets demands. There is an increasing need to strengthen those unique human skills that cannot be easily replaced by machines, computers, algorithms and robots. In addition to digital competencies, building and strengthening complementary skills such as complex problem identification and problem-solving, critical thinking, and creativity, is essential to create the flexibility required for the current and future demands for the workforce. Ultimately, technologies are tools to solve problems. Competencies are needed to identify issues and to determine which tools are required, or even which technologies may need to be invented to address them.

18. Participants underscored the importance of closing the gender and digital divide, including overcoming structural barriers to access. Policies addressing skills mismatches should consider differences between and within countries, demographics, and geography. A thorough understanding of the skills base of countries and industries, as well as the changing future skills requirements, are necessary to accelerate progress in implementing the 2030 Agenda.

19. Member States are encouraged to incorporate training in digital competencies and soft skills in formal education and promote the study of STEM fields, particularly among female students. They should also implement mechanisms such as foresight to identify trends in ICT development and skills needs that help workers meet current and emerging demands for competences, and support workers and enterprises adapt to change.

20. International collaboration plays an essential role in improving human capacity in emerging technologies by facilitating collaborative research, technology transfer, and dissemination of knowledge on best practices in developing countries. In this regard, participants noted that China and UNCTAD are jointly implementing training workshops with 40 participants from CSTD member countries on STI policy and incubator development to improve STI capabilities for the achievement of the SDGs. China has also supported outstanding young scientists from developing countries, and Junior Professional Officers in support to the work of the CSTD. Participants also noted that the United States has encouraged basic research and multi-stakeholder collaboration on STI for SDGs.

Technology and digital gender divides

21. Participants emphasised that women and men are affected differently by technological change. For instance, although there is a growing demand in the workforce for people with ICT skills, in many countries women are still very much underrepresented in ICT specialist occupations. Women and girls representation are also low in other STEM fields. In upper secondary education globally only 10% of women are STEM graduates, compared with 60% of men. Only 35% of girls at the higher education level are in STEM fields, and fewer than 17% of computer science degrees go to female students. Moreover, female employment in both developed and emerging economies concentrates in low-growth occupations such as sales or clerical work.

22. Participants noted several examples where women that had made significant contributions to the development of computer sciences and technologies early on, including Lady Ada Lovelace, who programmed Babbage's machine, and the women who programmed the ENIAC. The causes for the current under participation of women in ICT are complex, but examples of successful efforts to address some of them show that it is possible to remove barriers. Participants noted that main challenges for women's higher participation were related to access, opportunity, availability of infrastructure and time. They also noted successful cases in tackling these challenges. For example, Malta launched a National Digital Strategy, which includes actions to increase female participation in ICT sectors and raise awareness on digital skills education and careers to reduce the gender imbalance in the technology sectors.

Enabling environment

23. To reap the benefits from rapid technological change, innovation systems must be effective. Enabling environment includes investing in digital infrastructure, policy and institutional development. Many countries have already put in place national strategies aimed at increasing digital infrastructure. For instance, South Africa's Revised Broadband Policy and Broadband Strategy aims to ensure universal access to ICTs by 2020. Some of the initiatives of this strategy include the establishment of a Digital Doorway for women in deep rural areas to have ICT access and obtain agricultural information. Another example is the Connect Home initiative in the United States, which is addressing the technology adoption issue by providing a low cost to free broadband access and digital literacy training for low-income families.

24. Nevertheless, today, more than half of the world's population are still offline, unable to benefit from the positive impact that information and communication technologies (ICTs) could have on their lives. Participants emphasised the need to reach people living in remote regions; to reduce differences between communities in urban and rural areas; for digital inclusion of the population in support of economic growth and poverty alleviation.

The role of the CSTD

25. Participants underscored the need for comprehensive assessment and foresight of the effects of technological change in developed and developing countries. These exercises should provide an evaluation of new and emerging technologies and identify potential setbacks and challenges while considering technological gaps within and between countries. Participants encouraged the CSTD, as the focal point for science technology and innovation within the UN system, to conduct analyses and foresight with a view to assisting countries to seize the opportunities afforded by technological change and to confront the associated challenges.