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Item 2 of the provisional agenda

Progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society at the regional and international levels

Item 3 of the provisional agenda

Science and technology for development: priority themes

Report on the intersessional panel meeting*

Held at the Palais des Nations, 25 and 26 October 2022

Prepared by the UNCTAD secretariat

* This report summarizes the intersessional panel's discussions. The findings, interpretations and conclusions expressed herein are those of the authors and do not necessarily reflect the views of the United Nations or its officials or Member States. This document has not been formally edited.

I. Introduction

1. At its twenty-fifth session¹ in March 2022, the Commission on Science and Technology for Development (CSTD) selected the following substantive themes for its 2022–2023 intersessional period:

(a) Technology and innovation for cleaner and more productive and competitive production;

(b) Ensuring safe water and sanitation for all: a solution by science, technology and innovation.

2. The Secretariat organized an intersessional panel meeting on 25 and 26 October 2022 to address these themes. The meeting also discussed progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society (WSIS) at the regional and international levels. The meeting intended to contribute to considerations by the CSTD at its twenty-sixth session from 27 to 31 March 2023. At the panel meeting, there was also an informal discussion on the CSTD's implementation of the recommendations emanating from the review of subsidiary bodies of the United Nations Economic and Social Council.

II. Organization of work

3. The meeting was attended by Member States, representatives of international organizations, civil society, the technical and academic community, and other observers. The documentation for the meeting included the issues papers on the two themes prepared by the Secretariat with inputs from the Member States and relevant international organizations, presentations, and written comments submitted by participants.²

III. Opening

4. The Acting Chair of the CSTD opened the panel meeting.³ The Director of the Division on Technology and Logistics of UNCTAD and Head of the CSTD Secretariat⁴ expressed her gratitude for Member States' and other stakeholders' contributions to the papers produced by the Secretariat. The Director elaborated on UNCTAD's ongoing and recent efforts to support developing countries in harnessing science, technology, and innovation (STI) for development. These included the following: (a) the establishment of a new and revitalized Gender Advisory Board of the CSTD; (b) the upcoming *Technology and Innovation Report 2023*, which analyses the opportunities and challenges faced by developing countries in an age of green innovation and climate change; (c) the technical cooperation projects on *technology assessment in South Africa, Seychelles, and Zambia*; (d) the finalization of the *STI Policy Reviews in Botswana* and another new review for the *Seychelles*; and (e) the continued capacity building activities under the *Technology Facilitation Mechanism of the United Nations*;

5. The Director also highlighted the capacity building activities for Member States under the auspices of the CSTD, which include: (a) the *CropWatch Innovative Cooperation Programme*, in collaboration with China, facilitating satellite data-based agricultural monitoring in developing countries; (b) the *Young Female Scientist Programme*, organized with the University of Okayama in Japan; (c) *training on the Bio-Circular-Green Economic Model* planned to be held, in collaboration with the permanent mission of Thailand and Thailand Science Research and Innovation, in Bangkok, in 2023 for female entrepreneurs and researchers from CSTD Member States; and (d) the *workshop on the Use of Advanced*

¹ The twenty-fifth session of the Commission on Science and Technology for Development was held essentially in physical format with a remote participation option.

² See <https://unctad.org/meeting/cstd-2022-2023-inter-sessional-panel>.

³ Mr. Mansour Al-Qurashi, Saudi Arabia.

⁴ Ms. Shamika Sirimanne, UNCTAD.

Technologies for Family Agriculture organized with Brazil that is open to experts from CSTD Member States. She called for the effective use of STI to tackle multiple global challenges, including the health and socioeconomic consequences of COVID-19, the alarming trajectory of climate change, and the food and energy crises unleashed by armed conflicts. She concluded by emphasizing the importance of collective actions, including through the CSTD.

IV. Progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society at the regional and international levels

6. The Vice-Chair of the CSTD moderated the first panel discussion.⁵ Participants considered the implementation of and follow-up to the outcomes of the WSIS in 2022 in several respects, including ongoing and new challenges, achievements, and activities at forums and conferences. Several speakers noted the challenges emanating from the COVID-19 pandemic, the decline of multi-stakeholder collaboration to address digital divides, and the inequalities associated with the diffusion of new technologies.

7. The keynote speaker⁶ underlined the critical role of science and technology in attaining the Sustainable Development Goals. The COVID-19 pandemic spotlighted the importance of digital technology and the need for governance to ensure flexibility and resilience in the face of future disruptions. He also referred to the *Global Digital Compact* (GDC) and its vision, process, and expected outcome. He noted that *The Office of the Envoy on Technology of the United Nations Secretary-General* (hereinafter the *Tech Envoy's office*) is tasked to support Member States in drafting the GDC under the following broad themes: (i) connecting the unconnected and addressing the digital divide; (ii) digital public goods and digital infrastructure; (iii) data protection and matters of data privacy, security and agency; and (iv) respect of human rights online, reliability and trust of information, and emerging issues around AI. Going forward, Member States should continue to take the lead on the GDC while employing a true multi-stakeholder approach. A *Ministerial Meeting* will be held in 2023 to prepare for *The Summit of the Future* in 2024, which offers a unique opportunity to gather global perspectives and ideas for an inspirational document on shaping a collective digital future. He emphasized the multi-stakeholder nature of this process by bringing together the private sector, civil society, the technology community, academia, and many others.

8. He called upon the Geneva community and the CSTD to contribute to GDC discussions. He urged CSTD Member States to contribute actively to the consultations of WSIS given the Commission's steering role and expressed his desire to begin this process, keep the community informed, and allow it to participate fully and influence the process. Finally, he referred to the WSIS+20 process which should combine both Geneva's and New York's wisdom with those from other parts of the world for the interest of the 2030 agenda.

9. In the ensuing discussions, speaking participants emphasized the need for better coordination and avoidance of unnecessary overlap while expressing strong support for the multilateral and multi-stakeholder process of the GDC. A delegate⁷ also noted the need to avoid overlapping processes to discuss mutual issues of interest.

10. Another delegate⁸ stated that a road map for digital cooperation requires a comprehensive analysis by the Member States which is aligned with the WSIS outcomes. Several participants spoke about the need of a people-centred digital society, ensuring human rights and the urgency to close digital divides.

⁵ Mr. Peter Major, Hungary.

⁶ Mr. Amandeep Gill, Envoy on Technology of the United Nations Secretary-General.

⁷ Representative of the Russian Federation.

⁸ Representative of Cuba.

11. A delegate⁹ welcomed the United Nations Secretary-General's call for agreement on the GDC. She highlighted that the adoption of digital technologies brings risks and that her country is greatly concerned about the weaponization of the internet, the misuse of tools such as AI to violate human rights, cyberattacks, and the spread of misinformation. The international community must work on these issues immediately and prevent and sanction such behaviour. A delegate¹⁰ questioned how to ensure that digitalization and human rights violations in digital platforms are factored in the GDC process so that the South can be a contributor and a participant in the future of a safer, fairer, and more equitable digital society. He said his country is concerned that emerging technologies like AI, machine learning, big data, and the Internet of Things (IoT) will further widen the digital gap. Developing countries face vast challenges in scaling up their digital capacities to reap the benefits of these technologies. Another delegate¹¹ stated that the persistence of digital divides was a matter of ethics as it precludes the digital technological development, and emphasized the importance of avoiding internet fragmentation. He inquired about the treatment of data governance, its importance in the development of AI, and whether addressing digital divides should also include financial and training aspects. A delegate¹² enquired about the United Nations' thoughts and plan to close the digital divide for developing countries and landlocked developing countries and to create an equitable digital environment.

12. A delegate¹³ recognized the critical role of digital technologies in all facets of life. He affirmed his country's support for the GDC and believes that all stakeholders have a role in this process. Some delegates questioned how the multi-stakeholder approach of the GDC will be implemented. Another delegate¹⁴ commented on the WSIS+20 review process, stressing that the WSIS and the GDC are complementary processes, and that Geneva is well-placed to lead these discussions. He also drew attention to the importance of the *Internet Governance Forum (IGF)* and its work. A delegate¹⁵ inquired about Tech Envoy's office's cooperation with the *Technology Facilitation Mechanism (TFM)* and questioned the Tech Envoy's office's role in the GDC. A delegate¹⁶ noted that many institutions are working on digital topics, asking how these inputs, including UNCTAD's *Digital Economy Report*, will be incorporated into the GDC. She queried how stakeholders could be included in the process to express the needs of developing countries. Another delegate¹⁷ expressed his country's support for the United Nations Technology Bank for Least Developed Countries and inquired about its role in the GDC. A delegate¹⁸ asked whether specific modalities are required for the GDC given the nature of digital ecosystems. He inquired to what extent the *Tech Envoy's office* was needed to support the other elements of *The Summit of the Future* and what collaboration is to be expected.

13. A delegate¹⁹ underlined the importance of open data for both the scientific community and governments and enquired about the practicalities of stakeholder engagement, especially in the Global South, and how her country could help.

14. Another delegate²⁰ asked how countries should manage AI and invited other delegates and the Secretariat to attend the forthcoming multi-stakeholder *Responsible Artificial Intelligence in the Military Domain (REAIM) Conference*²¹ hosted by the Dutch Ministry of Foreign Affairs in February 2023, which will address the responsible development, deployment, and use of AI in the military domain.

⁹ Representative of Portugal.

¹⁰ Representative of the Gambia.

¹¹ Representative of Brazil.

¹² Representative of the Islamic Republic of Iran.

¹³ Representative of the United States.

¹⁴ Representative of the United Kingdom.

¹⁵ Representative of Latvia.

¹⁶ Representative of Guatemala.

¹⁷ Representative of Bangladesh.

¹⁸ Representative of Canada.

¹⁹ Representative of Austria.

²⁰ Representative of the Netherlands.

²¹ <https://www.government.nl/ministries/ministry-of-foreign-affairs/events/reaim>.

15. In responding to the interventions, the keynote speaker²² noted a fragmentation of efforts on STI within the United Nations system and underlined the crucial importance of stringing these pieces together to give them coherence. As such, the *Tech Envoy's* office's mandate includes facilitating collective and collaborative actions in digital issues. His office will liaise with experts on digital transformation for countries to devise plans to manage and leverage this process. Collaboration with the United Nations Technology Bank for Least Developed Countries is being considered. On the *Tech Envoy's* office's plan to address the digital divide, he stated that the work must go beyond connectivity and find new ways of bringing new technologies together alongside creating digital public infrastructure that lowers the entry barriers to the digital economy. He also stressed the importance of financing and appealed to all international financial institutions to dedicate more funds to digital infrastructure. He concurred with delegates' opinions that data and AI are not luxuries. Nevertheless, Africa only generates 1 per cent of patents, and these mostly come from South Africa. Opportunities must be created to build the capacity for developing countries to devise their AI-based models and solutions. He maintained that AI and development feature prominently in the GDC and looks forward to working on this with colleagues from UNCTAD, UNDP, ITU, DESA and others.

16. In his view, AI regulation have three tiers: (i) internationally shared priorities and approaches on AI governance that do not thwart innovation; (ii) national and regional regulations that are more substantive and deal with data protection such as in Brazil, China, India, Singapore and the United States; and (iii) industry-level standards and self-regulation. The United Nations will face the challenge of aligning these three layers, and its office will ensure that learning experiences and best practices are shared. He noted that some overlap in work might be necessary, especially concerning the IGF and the WSIS processes. To ensure synergies, collaboration is important.

17. The expert panel discussed progress made in the implementation of and follow-up to the outcomes of the WSIS at the regional and international levels. One expert²³ stressed the ethos of WSIS of an information society that is people-centred, inclusive, and digitally oriented. He noted that the changes in the information and technology sector have been unparalleled in the last 40 years. In this regard, important lessons can be drawn from the WSIS experience: (i) technological advancements can evolve differently than what has been predicted; (ii) the speed of policy formulation is often significantly slower than the pace of technological change; (iii) more awareness has been built of the risks of digital platforms; (iv) the internet can be a channel for both information and disinformation; (v) long-term changes arising in our society can have far-reaching impacts also on mental health. These aspects, as well as recent events such as the pandemic, geopolitical tensions, and the growth of data governance, will have to be carefully considered in the WSIS+20 review.

18. The first panellist²⁴ provided updates on the IGF following CSTD recommendations. Under a renovated structure and leadership, work has been done in areas including its national sub-regional youth IGFs and its parliamentary track, wherein legislative approaches to shaping a common digital future are shared and discussed with national parliamentarians. He introduced the upcoming 17th IGF in Addis Ababa at the end of November, which will be held under the theme Resilient Internet for a Shared Sustainable and Common Future.

19. The second panellist²⁵ reviewed the contexts, threats, and challenges that affect action toward the goals of WSIS, as well as key opportunities to contribute to the Sustainable Development Goals. He stated that four major factors have an impact on WSIS: (i) the heightened importance of digital aspects in supporting the Sustainable Development Goals due to growing inequalities, especially for marginalized communities worldwide; (ii) the climate crisis and the need to consider both negative and positive effects of

²² Mr. Amandeep Gill, Envoy on Technology of the United Nations Secretary-General.

²³ Mr. David Souter, Managing Director, ICT Development Associates.

²⁴ Mr. Chengetai Masango, Head of Office, United Nations Secretariat for the IGF.

²⁵ Mr. Mike Jensen, Labs-Community Networks Coordinator, Association for Progressive Communications, South Africa.

digitalization; (iii) the rise in global economic uncertainty and the impact of pandemics; (iv) geopolitical uncertainty and strife fomented by digital platforms through disinformation. Nevertheless, opportunities can be unlocked by frontier technologies. He concluded that there is a need to increase collaboration among parties and establish robust frameworks for multi-stakeholder decision-making processes that enable us to take advantage of opportunities and address challenges.

20. The third panellist²⁶ presented efforts in aligning WSIS action lines with the Sustainable Development Goals, including ITU's endeavours in organizing yearly multi-stakeholder discussions, including the WSIS Forum 2022. The participation in the event was significant, and several special initiatives originated, including the WSIS stocktaking Repository of Women in Technology, the WSIS gender trendsetters, and the WSIS youth campaigners.

21. During the interactive discussions, a delegate²⁷ inquired about regulations for improved connectivity. The panellist²⁸ responded that the cost-based access to infrastructure, the availability of radio spectrum, the licensing environments, and universal service funds available specifically for small-scale networks are three critical aspects in the regulatory environment that need to be addressed. In answering the question from a representative of a civil society organization²⁹ about why the advertising-supported media paradigm was losing ground, he said that the delivery of media has changed from a unidirectional informational flow to a system with an interactive environment that enables us to establish relationships directly with providers of products and services whose communication can be tailored to users' interests at a low cost.

22. A delegate³⁰ highlighted the need to respect cultural, religious, and moral values when using ICT and how they should be reflected in the upcoming CSTD work and reports. His country expects all existing processes to have a holistic and multi-stakeholder approach and be driven by Member States. He also proposed considering how economic sanctions can burden the development of ICTs.

23. Another delegate³¹ asked how the participation of key decision makers like parliamentarians in the technical meetings can be increased. He also warned about the current mistrust of these endeavours and wondered if this could be addressed and mitigated. A panellist³² replied that effective bottom-up multi-stakeholder engagement models for local communities were established in Kenya. She invited parliamentarians worldwide to participate in the *Parliamentary Symposium* of the 17th IGF in Addis Ababa.

24. The moderator concluded the session by reminding Member States that preparations must begin for the WSIS+20 review in 2025 and suggested that regional group discussions be initiated.

V. Theme 1: Technology and innovation for cleaner and more productive and competitive production

25. The issues paper presented by the CSTD Secretariat³³ on this theme shows that technologies and innovation for cleaner, more productive, and competitive production can catalyse economic growth and structural transformation while also addressing the existential threat posed by climate change. National policies are vital to preparing for and creating these green windows of opportunity, and several Member States have shared their policies and strategies. However, many countries need assistance in designing and

²⁶ Ms. Gitanjali Sah, Strategy and Policy Coordinator, International Telecommunications Union.

²⁷ Representative of Peru.

²⁸ Mr. Mike Jensen, Labs-Community Networks Coordinator, Association for Progressive Communications, South Africa.

²⁹ OneGoal initiative.

³⁰ Representative of the Islamic Republic of Iran.

³¹ Representative of Kenya.

³² Mr. Chengetai Masango, Head of Office, United Nations Secretariat for the IGF.

³³ Mr. Clovis Freire Junior, UNCTAD.

implementing the required sector-specific strategy due to low technical and financial resources. International cooperation, therefore, plays a critical role in filling those gaps and supporting developing countries to benefit from these green windows of opportunity.

26. The Vice-Chair of the CSTD³⁴ moderated the panel discussion. The first panellist³⁵ presented an analytical framework for understanding the green windows of opportunity. These are usually endogenous and based on Governments' own policies. Seizing green windows depends on the country's preconditions and the response patterns of public and private actors. There is significant variability in catch-up trajectories at the sector and country levels, depending on technological tradability and maturity. In mature sectors such as biomass or solar photovoltaics, readily available technologies can provide a relatively fast track to boosting economic activities. Conversely, less mature technologies like green hydrogen are more demanding in terms of new technological capabilities and require significant investments in research and development and innovation system development. International organizations such as the United Nations have a key role in sustaining institutional change-led, mission-oriented green windows and expanding the diversity of sustainable pathways.

27. Another panellist³⁶ noted that digital and green transformations have had separate trajectories and policy domains in the past while increasingly complementing each other. Institutional, market, and technology drivers foster the greening of global value chains in manufacturing industries, and digitalization is accelerating this process. Nonetheless, heterogeneity exists between and within countries. Import and adoption of advanced digital technologies is limited to a small number of emerging economies, while a few advanced economies and China are often sole producers. Countries need to design and implement policies that favour the development of digital infrastructure to address within-country connectivity gaps, build capability for green and digital chains, establish international partnerships, set standards and regulations, and provide financial support.

28. One panellist³⁷ discussed international cooperation to promote green innovations. Offering green hydrogen as an example, he highlighted the need to develop and implement sustainability-oriented innovation systems at unprecedented speed due to imminent ecological degradation and the crossing of irreversible climatic thresholds. He drew attention to the necessity for international organizations and donors to support South–South cooperation and regional sectors of excellence for green technology. He stressed that public–private partnerships are crucial for the fast diffusion of green innovation globally and should be encouraged in line with Sustainable Development Goal 17. Additionally, the panellist presented arguments in favour of shifting research and development for green innovation to a multilateral level, aided by an open-access philosophy. He then illustrated the merits of multilateral approaches to technology assessment to ensure the adequate inclusion of developing countries' perspectives. He finally promoted the idea of a “multilateral challenge fund” to mobilize sustainable creative thinking at an international level.

29. The final panellist³⁸ focussed on African countries' preparedness level for adopting frontier technologies and their potential role in cleaner production. Her findings were based on an UNCTAD study piloted in Ghana on the firm-level adoption of frontier technologies. After asserting the importance of creating policy and regulatory environments to facilitate the transfer and adoption of technologies and adequate institutional arrangements, the speaker presented the study's findings. The analysis of firm-level surveys revealed that the level of awareness of frontier technologies is high but that more firms tend to adopt less sophisticated frontier technologies. In addition, the study reveals that progress needs to be achieved to strengthen the skills and capabilities of the workforce on frontier technologies and that national policy must be formulated to accelerate the adoption of such technologies.

³⁴ Mr. Muhammadou M.O. KAH, the Gambia.

³⁵ Mr. Rasmus Lema, Associate Professor, UNU-MERIT, the Netherlands.

³⁶ Ms. Roberta Rabellotti, Professor of Economics, University of Pavia, Italy.

³⁷ Mr. Andreas Stamm, Senior Researcher, German Institute for Development Policy, Germany.

³⁸ Ms. Wilhelmina Quaye, Director, CSIR-Science, and Technology Policy Research Institute, Ghana.

30. One speaker³⁹ presented the progress in the use of advanced biogas. He mentioned the example of the ProAlcohol programme in Brazil, a successful national initiative involving ethanol production by using sugarcane as feedstock that has quickly propelled Brazil into the world's largest ethanol producers and exporters while creating green jobs and reducing CO₂ emissions. Other advancements have been observed in 2G ethanol, 2G biorefineries, and biomass sustainable aviation fuel (SAF) obtained from renewable biomass, which can bring further reduction of CO₂. The speaker also called for more significant efforts in exploring the comparative advantage of tropical areas and degraded land in Africa, Latin America, and Asia. Finally, he stated that multilateral agencies should ensure effective technology transfer, considering the greening of the entire value chain, and should continue to play a vital role in leading governance security and a better investment climate in developing regions.

31. Another speaker⁴⁰ highlighted that China prioritizes reorienting its industrial structure towards a cleaner, upgraded path to spur high-quality development. This has been aided by Chinese innovation and green technologies, which have tackled major issues concerning public welfare, enhanced living standards, and promoted sustainable social development. She stressed the importance of incorporating political commitments, development strategies, science and technical research, regulations and industrial perspectives. This approach has brought about innovations for reducing carbon dioxide emissions and achieving carbon neutrality. In her view China's experiences in technology, innovation and industrial upgrading could be helpful for other developing countries' policymakers and the wider international community.

32. In interacting with the panellists, some delegates⁴¹ shared initiatives and policy instruments their countries have put in place for greening their economies. The Philippines have developed an array of tools, such as the Renewable Energy App and the special programme providing seed funds for small and medium enterprises. In Thailand, a Mobile Application monitors smog at the community level, while the United States has created multi-stakeholder accelerators, and Egypt has advanced in establishing smart cities. Paraguay has spawned various initiatives, including the Omega Green Project and the Pro Ciencia Project; while Oman has employed drones in agriculture, Gambia is increasingly using renewable energy, and India has intensified its effort in recycling.

33. Other delegates⁴² emphasized the importance of a just transition and the consideration of unintended consequences of new technologies, particularly the need for a better understanding of the social impacts of rapid technological change. A delegate⁴³ emphasized the need to strike a balance between the fight against climate change and other development strategies.

34. Concerning challenges for technology and innovation for cleaner, more productive, and competitive production, a delegate⁴⁴ mentioned that technology should be perceived as a tool to achieve the Sustainable Development Goals rather than a goal in itself, and that policymakers should be mindful of potential technology-driven unemployment. Another delegate⁴⁵ echoed this concern, pointing out the high cost associated with the green transition, particularly for small and medium enterprises (SMEs), and highlighted the challenge posed by poor infrastructure. Some delegates⁴⁶ raised the problem of financial constraints, including a dearth of funding and a lack of public and private investments in research and development for frontier technology and clean and renewable energy. Other delegates⁴⁷ stated that their human capital is insufficient due to a lack of skill set and

³⁹ Mr. Bernardo Gradin, CEO of Granbio.

⁴⁰ Ms. Yaxin Zhang, Director, Research Institute for Environmental Innovation (Suzhou) Tsinghua, China.

⁴¹ Representatives of Egypt, the United States, the Gambia, India, Paraguay, the Philippines. Oman and Thailand.

⁴² Representatives of Austria, Cuba, and South Africa.

⁴³ Representative of South Africa.

⁴⁴ Representative of Cuba.

⁴⁵ Representative of the Philippines.

⁴⁶ Representatives of the Philippines and Guatemala.

⁴⁷ Representatives of Egypt and the Gambia.

know-how to sustain the green technology system. Some delegates⁴⁸ focused on data, citing the scarcity of data to measure and monitor progress toward the Sustainable Development Goals and bringing the threat of the digital divide to the fore. Finally, other delegates⁴⁹ highlighted the importance of policy's need to balance the immediate national agenda and a green transition and stressed the need to create an enabling environment of technology transfer and access to information for developing countries.

35. To tackle these challenges, delegates called for a profound, full-scale assessment of the consequences of adopting frontier technologies, which should be implemented and shared internationally. Regarding the labour-displacing impact of automation, measures and precautions should be taken ex-ante, such as labour reallocation. It is equally crucial to assess the impact of the global value chain greening to identify the net impact. All issues should be addressed in the framework of the Sustainable Development Goals and circular economy. It is essential to bring together all stakeholders early to foster an effective public-private partnership and to create an enabling environment of learning and technology transfer. In this regard, project-based technology transfer can play a vital role in implementing public-private partnerships effectively. International organizations will lead in providing and mobilizing funding to achieve influence on a global scale. It is crucial to align industrial, environmental, energy, and trade policies to perceive sustainable development in its entirety rather than segmented initiatives, to seize green windows and promote inclusive economic growth, and to fulfil a joint development between green and digital twin transformation.

VI. Theme 2: Ensuring safe water and sanitation for all: a solution by science, technology and innovation

36. The CSTD Secretariat⁵⁰ presented the issues paper on the second theme. The paper examines the role and potential of STI as key enablers for catalytic change in the world's achievement of Sustainable Development Goal 6 on clean water and sanitation for all. It highlights the deep-rooted relationship between the two and analyses how STI can contribute significantly to overcoming the persistent challenges in delivering on Sustainable Development Goal 6, with a focus on the distribution and delivery of safe water and sanitation, integrated water resource management, use of frontier technologies, and addressing inequalities in the sector, notably in relation to gender. Countries are recommended to consider STI as part of an answer that requires careful context-specific policies to bring it to fruition, embracing decentralized solutions, and considering nexuses that water shares with other sectors. To help translate STI into real world impact, the report suggests how the international community can go a long way to assist countries in achieving Sustainable Development Goal 6 by pooling its knowledge and technological know-how through sharing mechanisms and developing innovative financial mechanisms to support water and sanitation projects in developing countries.

37. The panel was moderated by a Vice-Chair of the Commission on Science and Technology for Development.⁵¹ The first panellist⁵² presented an overview of the water, sanitation, and hygiene (WASH) sector in Africa, the challenges faced by the sector, and the role that STI can play in spurring its development. Noting the need to quadruple the speed of the current performance to achieve Sustainable Development Goal 6 targets and the repercussions of failure on all other Sustainable Development Goals, the speaker explained the great disparity between and within African countries in access to WASH. She presented additional challenges, such as lack of access to public water supply, a dearth of funding, the need to channel efforts into scaling up indigenous solutions, and the miscoordination among stakeholders who often employ a siloed approach. The speaker called for appropriate consideration and investment in indigenous technologies, as well as

⁴⁸ Representatives of Egypt and South Africa.

⁴⁹ Representatives of South Africa and the Islamic Republic of Iran.

⁵⁰ Ms. Liping Zhang, UNCTAD.

⁵¹ Ms. Ana Cristina das Neves, Portugal.

⁵² Ms. Boluwaji Onabolu, CEO of WASHmata Initiative.

building awareness of STIs and increasing external aid. For STI to be a catalyst and capable of addressing Africa's WASH challenges, it is necessary to bear in mind the context and difficulties specific to African countries.

38. The second panellist⁵³ presented the TI Bus, a social enterprise initiative in India. The speaker described how these women-only public toilets in refurbished buses were created in response to a gendered sanitation crisis in Pune, where women lacked access to safe and clean public lavatories. The service can be found at any location by an app modelled on the Uber taxi service called Honeysuckle that includes a Google mapping function of nearby TI buses and other toilets. The buses have buzzers to call trained female attendants, panic buttons, baby changing facilities, access to menstrual products and healthcare information, smart toilet technology such as floor cleaning mechanisms, IoT-based waste management facilities, and feedback buttons. The panellist emphasized that they are designed with a sustainable and scalable business model and stressed the positive contribution that small businesses can make to the WASH sector while creating opportunities for local people to monetize innovative technological solutions to local problems.

39. The third panellist⁵⁴ highlighted water innovations and areas to focus on to tackle the growing challenges of water insecurity through integrated water resource management (IWRM) as it affects access to drinking water, agriculture, and the environment. Circular economy approaches to water and sanitation allow to move beyond freshwater resources, but they have distinct financial, institutional, environmental, technical, social, and health requirements. Agriculture is the largest consumer of water resources while simultaneously being challenged to provide more food to meet growing global demand. Despite this, appropriate agricultural practices can help close the growing water storage gap. Innovative water management and governance require as much attention as infrastructure receives. It is crucial to bring all water solutions, including off-grid ones, into IWRM using water accounting, remote sensing, and citizen science. Cross-sectoral coordination across the household-agriculture-energy nexus is key, given their interlinkages. The panellist recommended investing in overcoming systemic barriers preventing innovations from going to scale, adapting and scaling circular economy approaches to ensure that context-specificity is included, focusing not only on freshwater resources but also on reuse and bundling innovations across spectra to address and take into account the different needs of different stakeholders.

40. The last panellist⁵⁵ drew attention to the provision of water and sanitation services in Latin America. He reflected on the lessons of COVID-19, and how recent floods on the continent highlight the need for climate change-resilient infrastructure. He described solutions developed by the Inter-American Development Bank (IDB), including the free hydro-bid tool using satellite map data from NASA available to all countries for water resource management and planning. The IDB also operates the Aqua Rating assessment tool that can provide both a snapshot of service quality, business management, and operational efficiency and roadmaps based on utility ratings for future improvement pathways. The panellist drew attention to the work of the Latin American Water Funds Partnership on creating financial, governance, and implementation mechanisms for planning and conservation and to the work of the water and sanitation Observatory for Latin America and the Caribbean on data provision. He finished with three recommendations: (a) to focus on supporting service providers; (b) to build organizational cultures conducive to productive feedback; and (c) to foster innovation ecosystems within regions.

41. During the interactive discussions, some delegates⁵⁶ called for the international community to expand STI exchanges and cooperation with other countries, provide innovative financing opportunities, and cultivate and internationalize the research environment. Participants expressed their appreciation and support for the CSTD, which

⁵³ Mr. Rajeev Kher, Founder of Ti Bus, India.

⁵⁴ Ms. Petra Schmitter, Principal Scientist, International Water Management Institute.

⁵⁵ Mr. Sergio I. Campos G, Inter-American Development Bank.

⁵⁶ Representatives of Thailand, Latvia, Guatemala, Cameroon and China.

continuously provides a platform for countries to discuss common challenges and share experiences and good practices. Other delegates⁵⁷ advocated for an enabling environment for technology transfer. They called for sharing best practices materialized through the implementation of North-South projects and triangular cooperation facilitated by the CSTD to build inclusive, sustainable ecosystems of water and sanitation entrepreneurship that complement the knowledge and water management systems.

42. Some delegates⁵⁸ shared their experience of using STI to provide their citizens access to safe water and sanitation. In the Philippines, the government has funded and distributed ceramic water filters and a low-cost modular rainwater collection system to local government units in the Philippines. They use AI and machine learning to curb water shortages in Manila. Simulation modelling software is in use in the private industry for dam and treatment plant management, and a satellite imagery project exists, with access available to public users from academic institutions and government agencies. In Oman, the government has built dams along their seafront to better access and harness underground reserves. In 2020, the Oman Energy Centre began an STI project called the Leaks Diction System, which collects data on water consumption without human effort and has created a 15 per cent reduction in water waste through the use of smart meters. A delegate⁵⁹ shared the country's new STI knowledge and data management platform (perucris.pe), which aggregates information regarding projects and publications, including in water and sanitation.

43. Some delegates⁶⁰ showcased their progress towards achieving Sustainable Development Goal 6 in 2030. In Thailand, while 100 per cent of the population uses safely managed drinking water services, 26 per cent use safely managed sanitation services. Thailand recognizes the importance of wastewater, resource management, and protection against climate change. Nepal was declared an open defecation-free country in 2019 and 94 per cent of its population has access to basic drinking water. However, only 2 per cent of the country's population currently benefiting from wastewater treatment facilities. The Government of Nepal is, therefore, currently prioritizing protecting surface and groundwater sources, arranging adequate investment in the sector and attracting proper management in the private sector.

44. One delegate⁶¹ shared the innovations to implement his country's water policy priorities: (a) the mitigation and adaptation to the impact of climate change on safe water supplies, especially through flood predictions and warnings (earth-observation- and sensor-based data collection and 3D river flood models); (b) water resource management for sustainable energy generation to reduce water prices and stimulate interest in centralized water supply; (c) gender equality in the water sector. He shared the willingness of Latvia to create new synergies with global partners.

45. Some delegates⁶² highlighted the need to improve infrastructure, management, and treatment facilities for water and sanitation and to increase populations' ability to use them effectively. They underlined the importance of international cooperation for access to WASH solutions and knowledge and financing opportunities. The main obstacles for developing countries such as Guatemala when addressing these problems are the need for more public investment, research, and scientific and evidence-based solutions applicable to the context. Guatemala recognizes the country's need to focus on improving water governance. Meanwhile, Egypt wishes to diversify its sources of financing for water and sanitation, moving away from public investment only towards a more diverse model, including private sector investment and local community contributions alongside international assistance. In Egypt, there is lack of communication mechanisms between the Government and private sector stymies progress, while poor households' tendency not to prioritize WASH means they are unwilling to pay for these services and create demand.

⁵⁷ Representatives of the Islamic Republic of Iran and the Plurinational State of Bolivia.

⁵⁸ Representatives of the Philippines and Oman.

⁵⁹ Representative of Peru.

⁶⁰ Representatives of Thailand and Nepal.

⁶¹ Representative of Latvia.

⁶² Representatives of Guatemala, Egypt and the State of Palestine.

Palestine faces challenges in managing, developing, and protecting water resources and infrastructure in an integrated and sustainable manner. The delegate called for a data-centred and STI-intensive revision of cross-border water treatment systems and gave the example of Japan to help his country address access to clean water by funding desalination technology and water service management. A delegate⁶³ emphasized that access to clean water is important to ensure stability, therefore it is in everyone's interest to ensure clean water for all population.

46. Several delegates⁶⁴ highlighted the challenges faced by African countries to achieve universal access to water and sanitation, despite continued progress. In Kenya, rapid population growth, particularly in urban areas, is a concern for the country and its aging water infrastructure. Other challenges include inadequate wastewater management, poor farming practices, deforestation, pollution, erosion, and harsh and unpredictable weather conditions caused by climate change. He shared his country's policies and projects in cooperation with international WASH partners. He highlighted the Catchment to Tap flagship project, which aims to link IWRM with WASH while addressing emerging water use and exploitation challenges in key catchment areas. The Kenya Towns Sustainable Water Supply and Sanitation Programme is being implemented in 28 towns through tailored local projects. Kenya has also benefitted from the regional Sustainable Water and Sanitation in Africa project to achieve long-term financial sustainability by applying market-based principles. He also noted support for circular economy approaches but stated that technical assistance and capacity building are needed for Kenya to adopt them. In Burundi, the country aims for adequate universal WASH access by 2030. However, open defecation remains a reality. The sector is facing challenges, including low investment, infrastructure management, population management, issues with drainage networks, low ownership of achievements in the sector by beneficiaries, and threats from climate change. In Cameroon, 40 per cent of their population lives below the poverty line and has no access to social services and basic WASH facilities, with women and children being the worst affected. Cameroon aims to provide universal drinking water access by 2030, increase national coverage from 34 per cent in 2010 to 57 per cent in 2020, and eradicate open defecation by 2035.

47. A delegate⁶⁵ highlighted the vital importance of safe water and sanitation to human well-being and prosperity. China has implemented major projects for preserving and restoring ecosystems by coordinating and controlling pollution. She stressed the need to adopt a people-centred development philosophy. She also affirmed the efforts of China to improve aquatic environments and ecosystems, strengthen the ecological conservation of major freshwater systems, and generally eliminate black water bodies to protect public health and the natural environment.

48. Another delegate⁶⁶ pointed to the urban-rural divide in WASH services and outlined the increasing lack of water resources created mainly by climate change, drought, and low rainfall. The delegate raised concern over inequality in financial resources and the scope of knowledge and science as an exacerbator of issues in the WASH sector, both within societies and between countries. A delegate⁶⁷ drew attention to the new 2022 Kumamoto WASH initiative, which is part of the Japanese government's effort to solve water and climate-related issues worldwide. It has a specific emphasis on STI, including satellite imaging data and numerical-based technology for water-related risk assessments.

VII. Main messages for consideration by the twenty-sixth session of the Commission

49. The following findings and suggestions on the two priority themes were highlighted at the panel meeting and put forward for consideration by CSTD at its twenty-sixth session.

⁶³ Representative of Israel.

⁶⁴ Representatives of Kenya, Cameroon and Burundi.

⁶⁵ Representative of China.

⁶⁶ Representative of the Islamic Republic of Iran.

⁶⁷ Representative of Japan.

A. Technology and innovation for cleaner and more productive and competitive production

1. Main findings

50. The North-South divide in innovation performance is pronounced. This implies that many developing countries will need strong support from developed countries in identifying and implementing innovations to tackle global challenges. This happens at a time when impacts of climate change are also hitting many developing countries, which would need scaling up research to understand the chain reactions related to global warming and science and technology to develop mitigation options and take advantage of green windows of opportunity.

51. Thus, it is urgent to embed STI into concepts of fair globalization, implying that the needs of developing countries receive adequate attention in international agenda and priority setting and that they can benefit adequately from sharing of knowledge and experience. This is more pressing than ever in times of worsening climate change and its impacts on the developing world, e.g. exposure to natural disasters and deteriorated food security. Another element of fair globalization has to be that developing countries are granted all policy space required to reap the rewards of green windows of opportunity as a basis for sustainable development.

2. Suggestions

52. Member States may wish to consider the following courses of action:

(a) Develop and expand national policies and strategies, with clear strategic direction and road maps, and regulatory and legal framework, to further promote green innovation and the development, production, use, and scaling-up of green and renewable energy technologies;

(b) Establish a national mechanism for the coordination of sustainable development strategies and the deployment of green technologies;

(c) Raise awareness and promote technical education and skills development to increase domestic firms' capacity for applying green technologies;

(d) Identify, prioritize and foster green technologies and potential new sectors for sustainable diversification and structural transformation;

(e) Invest and promote private sector investment in research and development on the application of technologies for cleaner production;

(f) Support effective green technology transfer ecosystems that meet the needs of the private sector and, in particular, promote green technology diffusion in SMEs;

(g) Strengthen innovation networks and linkages to increase partnerships and cooperation to enable green technologies' production and broader diffusion;

(h) Ensure that infrastructure and incentives exist for consumer demand to shift towards products with lower environmental impact, including through prioritizing cleaner and more productive technologies and solutions in public procurement;

(i) Support the engagement of organized civil society in promoting the diffusion and adoption of green technologies;

(j) Intensify efforts in establishing and improving bilateral and multilateral partnerships and North-South and South-South cooperation to facilitate the transfer of technologies for cleaner and more productive production.

53. The international community may wish to consider the following suggestions:

(a) Facilitate the exchange of knowledge, experience, success stories, research, and best practices on green innovation with leading innovators, policymakers, and regulators in developed and developing countries;

(b) Establish policy research platforms and provide technical and policy advice on greener technology and innovation to policymakers;

(c) Create a cross-border system of open green innovation facilitating efficient communication and collaboration between authorities, corporations, researchers, academia, and individuals, and providing avenues and incentives to those who collaborate;

(d) Establish, expand and strengthen international research and development and innovation support programmes on greener technologies and clean production;

(e) Establish international innovation hubs, maker spaces and centres focusing on innovation towards cleaner and more productive production;

(f) Promote South-South, North-South and triangular cooperation for knowledge and technology transfer on greener technologies;

(g) Support developing countries in their capacities to implement technology assessment towards cleaner and more productive production, including how to assess new technologies on the multilateral level;

(h) Increase the amount of official development assistance directed to STI and build advanced capacities in technology development to enable the transition to renewable energy sources and long-term low-emission development;

54. The Commission is encouraged to take the following steps:

(a) Collect and share success stories and business cases demonstrating the impact of new technologies on inclusive and sustainable development;

(b) Facilitate international partnerships for mobilizing resources and providing technical assistance on effective policy mix for incentivizing the adoption of technologies for cleaner and more productive production in developing countries;

(c) Support the participation of actors of the innovation system of the Member States in international networks and programmes to build their capacity in innovation for cleaner and more productive production.

B. Ensuring safe water and sanitation for all: a solution by science, technology and innovation

1. Main findings

55. STI is central to strategies for the achievement of Sustainable Development Goal 6 on clean water and sanitation for all and has the potential to act as a catalyst for progress toward overcoming the persistent ongoing challenges in this sector. These challenges include effective distribution and delivery of safe water and sanitation, integrated water resource management, and addressing disparities in the sector, such as gender inequality. Key considerations for countries deploying STI for Sustainable Development Goal 6 include how frontier technologies may offer significant opportunities for innovation to this end and the need for context-specific policies that consider multilateral cooperation around transboundary waters and decentralized solutions. Intermediate solutions and innovations using sharing mechanisms for existing knowledge and resources to bridge gaps during transitions towards more technologically advanced long-term solutions must also be prioritized.

2. Suggestions

56. Member States may wish to consider the following courses of action:

(a) Cultivate and empower local research and innovation ecosystems through building technology acceptance and promote digital mindsets and capacity-building skills while carefully considering target communities' financial, social, cultural, geographical, and climatic conditions, including their ability to operate and maintain technological solutions.

(b) Develop close partnerships between practitioners and users, with a focus on community involvement by providing assistance to grassroots- and community-led participatory initiatives to strengthen local water and sanitation resource ownership and enhance water governance by bringing practitioners and users together.

(c) Prioritise the development, distribution and implementation of modular, off-grid, and decentralized low-tech solutions through monitoring and accounting systems and citizen science for water collection, purification, and waste disposal. Extend access in last-mile communities, particularly in rural areas, using affordable, context-appropriate, and flexible technological solutions.

(d) Transform infrastructure and service delivery for gender equality by promoting appropriate sanitation service delivery in households and public spaces to alleviate gender-based burdens and discrimination; designing water and sanitation policies and projects with a gender lens to ensure they do not perpetuate gender disparities based on data disaggregated by gender.

(e) Introduce or overhaul data infrastructure in water and sanitation by establishing simple, systemic, human-centric, and multi-stakeholder collaborative systems to support a more comprehensive water resources assessment, improving decision-making and minimizing water losses and waste.

(f) Scale up good practices for universal access to water and sanitation and IWRM with proven track records through assessment which factors hinder or accelerate local scale-up of good practices and seek to address or promote them appropriately; exploring and promoting circular economy approaches to water and sanitation to turn treated wastewater into a water resource where appropriate.

(g) Introduce new, innovative, and more equitable financing mechanisms by adopting blended financing models at the macro-level, combined with micro-financing for small scale operators, to foster an enabling environment for sustainable water business; and by increasing donors' and institutional investors' attention to Sustainable Development Goal 6, highlighting the essential role that water and sanitation plays in all countries' economic, social and environmental spheres.

57. The international community may wish to consider the following suggestions:

(a) Promote knowledge transfer and capacity building through North-South, South-South, and triangular cooperation. Engage multilateral organizations, development agencies, global networks of actors on water and sanitation, and the CSTD to actively increase the global flow of water and sanitation STI knowledge, from current production centres to all Member States and to build synergies between initiatives.

(b) Promote technology transfer between developed and developing countries through transferring complete packages, including building local capacity and capability to operate, maintain, and, where needed, adapt them to the local context, in the upgrading of water and sanitation infrastructure or development of water management in developing countries.

(c) Develop financial mechanisms which promote financial assistance from high-income countries and investment from the private sector to developing countries, especially LDCs, LLDCs and SIDS, recognizing the cross-cutting role these play in achieving the 2030 agenda for sustainable development.

(d) Prepare the global water and sanitation community for the effects of climate change through cooperation and a global focus on increasing climate resilience for water and sanitation systems. Ensure shared knowledge and STI solutions have built-in climate resilience. Promote cross-sectoral coordination through a nexus approach such as water-energy-agriculture nexus to exploit their interlinkages.