Commission on Science and Technology for Development (CSTD)

Contribution to the 2022 High-level Political Forum

This note synthesizes findings from the Commission on Science and Technology for Development (CSTD) as a contribution to the High-level Political Forum (HLPF) scheduled to take place from 5 to 15 July 2022. It follows the outline proposed by the HLPF secretariat and draws on the two priority themes of the CSTD during the 2021-2022 inter-sessional period, namely (a) industry 4.0 for inclusive development; and (b) science, technology and innovation for sustainable urban development in a post-pandemic world, and the findings and recommendations emerged during the virtual Inter-sessional Panel held on 18 and 22 January 2021. These findings and recommendations will be considered by the CSTD during its 25th annual session on 28 March to 01 April 2022. The 25th CSTD will also review progress made in the implementation of the outcomes of the World Summit on the Information Society and listen to presentations on science, technology and innovation policy reviews of Zambia, Botswana, and Angola.

1. **Progress, experience, lessons learned, challenges and impacts of the COVID-19 pandemic on the implementation of SDGs 4, 5, 14, 15 and 17 from the vantage point of CSTD, bearing in mind the three dimensions of sustainable development and the interlinkages across the SDGs and targets, including policy implications of their synergies and trade-offs;**

The impact of and responses to the coronavirus disease (COVID-19) pandemic have accelerated the dissemination of digital technologies in an era of already significant technological advances based on industry 4.0 technologies such as artificial intelligence, robotics and the Internet of things. The use of industry 4.0 technologies in manufacturing can help increase productivity and reduce the environmental impact of industrialization and may create more jobs than it replaces.

One of the CSTD's priority themes this year is "Industry 4.0 for inclusive development" (see: E/CN.16/2022/3). Industry 4.0 refers to the smart and connected production systems made possible by new technologies, particularly with the increased use of automation and data exchanges. Industry 4.0 is considered a new technological revolution based on digital technologies and connectivity, the integration of technologies and the interconnections between the physical, digital and biological spheres. The application of industry 4.0 technologies in manufacturing may result in productivity, energy efficiency and sustainability gains, thus contributing to the implementation of SDG 9, which will in turn produce positive impact on many SDGs through cost saving and revenue generation, including SDG 4, and 5.

Industry 4.0 could bring about important changes related to power, knowledge and wealth and may impact the pursuit of gender equality and SDG 5. Artificial intelligence is at the forefront of industry 4.0 and it is therefore critical to consider gender-related trends in the sector. Artificial intelligence systems

tend to reflect and amplify existing biases and prejudices, especially with regard to gender, because women are underrepresented in this sector; women account for only 26 per cent of data and artificial intelligence-related positions in the workforce. The effects of new technologies need to be better understood, particularly artificial intelligence, as they could affect gender equality by impacting women's employment, labour force participation and access to financial resources, thereby affecting women's economic and livelihood opportunities. Such an understanding can help in being able to address how industry 4.0 could be used to narrow the gender gap.

In harnessing Industry 4.0 for inclusive development, developing countries should be able to rely on technical and financial support through international cooperation and partnership including in the form of official development assistance (ODA). International cooperation and partnership is essential for supporting developing countries in building their capacities to properly identify ways to harness Industry 4.0 aligned with national development objectives and the SDGs, formulate coherent policies, and design appropriate policy instruments to promote Industry 4.0. Such cooperation and partnership is also critical for building the international institutional framework to harness Industry 4.0 technologies for the SDGs and address potential unintended consequences.

The CSTD intersessional panel also examined the priority theme "Science, technology and innovation for sustainable urban development in a post-pandemic world." (see: E/CN.16/2022/2). The commission explored the contribution of science, technology and innovation to mitigating the sustainability challenges facing urban sociotechnical systems and assesses the impact of the coronavirus disease (COVID-19) pandemic on sustainable urban development.

Concerning the implementation of SDG 4, urban areas have become the physical space in which the pandemic has worsened existing deep-rooted inequalities, with particular concern in education systems, where adults and children without Internet access have been left behind. On the other hand, the pandemic has showed the importance of science, technology and innovation systems in contributing to equipping society with the instruments and capabilities required to direct innovation efforts towards improving access to education in sustainable urban settings.

Regarding the implementation of SDG 5, sustainable and inclusive urbanization cannot be realized without the introduction of safeguards against existing gender gaps, biases and discrimination. Science, technology and innovation solutions in this area could provide range of new digital tools to non-technological interventions that support awareness-raising activities, community mobilization actions, educational programmes, legal and policy-related reforms and changes in institutional settings.

On the implementation of SDG 17, international cooperation efforts are needed to further pool, formalize and transfer available knowledge of effective science, technology, and innovation solutions. The coordinated effort is important to seize the innovation momentum from the pandemic and to use the transformative power of science, technology and innovation to deliver on the commitment to sustainable urban development are emphasized. International cooperation efforts are needed to further pool, formalize and transfer available knowledge of effective science, technology and innovation solutions.

The CSTD's review of progress made in the implementation of the outcomes of the World Summit on the Information Society at the regional and international levels (see A/77/62-E/2022/8) also notes several points. The role of digital technologies in mitigating the impacts of the pandemic has been substantial, enabling greater continuity than would otherwise have been possible. On the implementation of SDG 4,

digital technologies have helped students to learn remotely while schools and universities have been closed. However, online learning has not been possible for all, nor have they substituted fully for traditional modes of education.

In relation to the implementation of SDG 14 and 15, the relationship between digitalization and the environment is complex and interactive. Advances in data-gathering and analytics enable Governments and businesses to improve efficiency and target resources, potentially reducing energy consumption. This contributes to the development of strategies to reduce carbon emissions and mitigate climate impacts.

Furthermore, data corporations have moved towards the use of renewable energy sources for their operations and for data centres. In the meantime, we should be tackling the environment impact of increasing energy consumption, such as from the proliferation of devices, the growth of video and gaming markets, and deployment of frontier technologies such as autonomous vehicles and cryptocurrencies that will accelerate this energy consumption further.

Regarding the implementation of SDG 17, the complex and holistic character of digital development requires participation to also be multisectoral and multidisciplinary, linking the virtual opportunities identified through technology with the constraints identified through the social sciences and economics. Multilateral governance should also evolve to strengthen digital cooperation and to take advantage of new opportunities for and risks to sustainable development.

2. Assessment of the situation regarding the principle of "leaving no one behind" against the background of the COVID-19 pandemic and for the implementation of the 2030 Agenda, within the respective areas addressed by your intergovernmental body;

   a) Promote investments and facilitate financing for the deployment of Industry 4.0 and to ramp up technology transfer to ensure that the developing world is not left further behind in technological advancement

Countries, individually and through concerted international efforts, need to guide the development and deployment of industry 4.0 to support sustainable development and leave no one behind.

Since access to technologies can be unequal among population and between countries, it will be necessary for governments and international bodies to ensure that all groups of population are benefitting from the new developments, including for women and people with disabilities. Policymakers in developing countries should be attuned to changes in trade patterns and rapid technological changes in global value chains and how these could affect the workforce. Workers who cannot be trained or retrained and who may lose their jobs should be able to rely on stronger social protection mechanisms.

There is a renewed importance placed on labour unions, to defend worker rights and legitimate concerns about jobs, given the increasing automation of tasks. Labour unions should strengthen and update collective bargaining agreements to cover the impact of industry 4.0 and devise new strategies for addressing the potential adverse effects of smart production on the well-being of workers. At the same time, employer organizations could develop targeted education and training to prepare workers for labour market changes and needs.

b) **Deploy and scale up science, technology, and innovation practices towards mitigating some of the most pressing sustainability challenges facing urban socio-technical systems in the post-pandemic world**

Urban areas have become the epicentre of the COVID-19 pandemic. Estimates show that 90% of the COVID-19 cases reported worldwide are located in urban settings, where the quality of life has been severely damaged by the devastating effects that the pandemic has caused. The COVID-19 pandemic has also led to a global economic crisis that has further highlighted the deep fragility of a labour market that is incapable of ensuring well-being and decent work for all. As a result, existing economic inequalities have been exacerbated and the level of poverty has increased, especially in the share of world population where vulnerable families rely on informal economic activities.

Urban areas have become the physical space in which COVID-19 has worsened existing deep-rooted inequalities caused by gender, age, and place of residence. Example of the higher pressure on economically disadvantaged groups and other vulnerable populations can be perceived when looking at education systems, where adults and children without Internet access have been left behind.

On the one hand, the pandemic has exposed the incapability of many urban settings to deliver on the expectations of disaster and risk management for urban resilience and sustainability. On the other hand, the pandemic has showcased the pivotal importance that STI systems play in contributing to equip society with the instruments and capabilities required to direct innovation efforts towards improving sustainable urban development and the resilience of urban systems. Scientific knowledge production processes, digital technology adoption, and innovations in organizational and institutional settings have contributed to mitigating the impact of COVID-19, helping many urban sociotechnical systems to continue to function during and post-pandemic world.

c) **The role of digital technologies in mitigating impacts from the pandemic has been substantial, enabling greater continuity than would have otherwise been possible.**

The past two years of the COVID-19 pandemic have themselves been a powerful reminder of the fragility of human life and the threats to prosperity and sustainable development that surround us. Digital technologies have done much to help humanity through the pandemic, particularly by enabling continuity in commerce and employment, but the pandemic has also served to demonstrate the relationships between digital, social and economic inclusion and exclusion.

Those who lack financial resources or experience discrimination are less likely to be digitally connected than others and those who lack digital connectivity are less able to access the resources that can lift them out of poverty and away from disadvantages. With that in mind, concerns about digital divides reflected in WSIS outcome documents remain important, with particular attention being paid to the risk that unequal access to digital technology will exacerbate divides in access to other developmental goods, perpetuating social and economic disparities.

Increases in the capacity of networks and devices have enabled successive waves of innovation in digital technology that have great potential for development, but which also pose risks to established rights and norms. The Commission' call for 'a people-centered, inclusive and development-oriented Information Society,' one that works for all humanity and leaves no-one behind, should be a powerful reminder of

these opportunities and risks as stakeholders reflect on the implications and possibilities of digital transformation.

3. **Actions and policy recommendations in areas requiring urgent attention in relation to the implementation of the SDGs under review;**

The two reports of the Secretary-General prepared for the 25th annual session of the CSTD (E/CN.16/2022/2 and E/CN.16/2022/3) contain several concrete suggestions for member States, as follows:

a) Industry 4.0

- To successfully facilitate the broad diffusion of industry 4.0 technologies and harness the benefits, developing countries should diversify production bases. Governments should facilitate the identification of potential sectors for diversification, promote key potential new sectors of national interest, strengthen the effectiveness of innovation systems to support diversification, build coherence between science, technology and innovation policy and other economic policies and involve a wide range of actors.

- Developing national strategies for industry 4.0 will be critical in guiding innovation efforts towards developing and deploying industry 4.0 technologies in manufacturing, investment promotion plan can be a part of this strategy. There are several examples in this regard among Commission members, as follows: the Government of Brazil has established the basket 4.0 initiative, which identifies priority industrial and technological segments of industry 4.0 for national investment and promotion; Latvia has designed and implemented the green channel initiative, eliminating administrative burdens on high value added investment; the Philippines has implemented an innovation-led industrial strategy aimed at removing obstacles to growth, to attract investment; South Africa, under the programme Digital Advantage 2035, guides the implementation of the national ICT research, development and innovation strategy and seeks to ensure comprehensive and transparent investment monitoring; and the Government of Thailand, as part of Industry 4.0 Strategy 2017–2036, aims to attract investment in future industries and services.

- Further recommendations included the mobilization of investment in ICT infrastructure, the creation of a proper regulatory environment, building necessary digital skills in workforce, and fostering multistakeholder collaborations. It will also be important to raise awareness about digital technologies among businesses and encourage academia, research and civil society to work with the private sector to deploy new technologies.

b) Sustainable Urban Development

- Adjust pre-pandemic priorities and resource allocation strategies; review and redefine any existing sustainable urban development priorities to take into account the impact of the pandemic; and

identify and invest in suitable science, technology and innovation solutions to alleviate unemployment and the financial issues experienced by low-income households and smaller firms;

- Cultivate and empower local ecosystems for urban innovation; frame an enabling institutional, policy-related and regulatory environment that promotes the development of an open innovation culture in urban spaces and facilitates cross-sectoral and multi-stakeholder collaboration; and expand incubation services to facilitate the transformation of business sector research in science, technology and innovation that actively helps solve urban development challenges;

- Introduce new and more equitable financing mechanisms; facilitate cross-sectoral collaborative ventures with heterogeneous actors to increase the financial capacity of cities and urban communities to support the research and development actions required to embrace science, technology and innovation solutions; and strengthen institutional settings to ensure that public investment management in cities and communities is supported by policy coherence across multiple levels of governance;

- Take an integrated approach to policy setting for sustainable urban development; help local development actors embrace the integrated approach to urban sustainability enhancement championed in the 2030 Agenda for Sustainable Development and the New Urban Agenda; and adjust institutional frameworks to integrate urban sustainability policy settings, horizontally and vertically, and ensure the coordination needed to maximize synergies among science, technology and innovation-related actions and minimize fragmentation and trade-offs;

4. **Policy recommendations, commitments and cooperation measures for promoting a sustainable, resilient and inclusive recovery from the pandemic while advancing the full implementation of the 2030 Agenda;**

Achieving the 2030 Agenda for Sustainable Development requires the full use of all the available tools and harnessing rapid technological change. Accelerating the effort to optimize industry 4.0 for inclusive development and promoting sustainable urban development must be an essential part of this process. In this regard, the following are recommended for policymakers and international community:

a) **Industry 4.0**

- Introduce financial measures that can help reinstate the financial stability of private and public sector organizations, especially in developing economies; and enhance international support by mobilizing additional financial resources for developing countries from multiple sources;

- Facilitate an enabling digital infrastructure by mobilizing investment in digital infrastructure and creating a regulatory environment for sound competition;

- Foster multi-stakeholder collaboration to create an industry 4.0 ecosystem by creating institutional mechanisms bringing together all relevant partners to develop a shared vision of industry 4.0 and coordinate its implementation;

- Build workforce skills for industry 4.0 through initiatives to qualify and retrain the workforce and pay particular attention to the different impacts of automation on women and men workers;

- Provide incentives for the private sector, including small and medium-sized enterprises, to use and develop applications using industry 4.0 technologies, including facilitating the acquisition of the hardware, software and tools needed.

- Increase investment in education in science, technology, engineering and mathematics in developing countries through targeted programmes, for example by supporting the education of girls in these fields;

b) Sustainable Urban Development

- Support cross-country collaborative research efforts by establishing common strategies for data collection and analysis that can facilitate benchmarking; and mobilize the resources required to increase the international availability of urban disaggregated data to obtain localized knowledge on the functioning of urban sociotechnical systems and prepare appropriate science, technology and innovation solutions;

- Ensure the cross-sectoral harmonization of urban sustainability policies across government levels, from local to global; and establish a virtual environment to facilitate international knowledge transfer and ensure that a global body of experience is available for all;

- Assist developing countries in structuring long-term collaborative efforts that extend beyond single projects and consider multi-year developments; and provide countries with guidance on how to develop effective local and national regulatory frameworks;

- Enhance capacity-building support to increase the availability of resources for scaling up research development capacity in response to an emergency condition; mobilize resources for supporting more research exploring the non-technological dimensions of urban digital transformations for urban sustainability; and ensure that research and development efforts towards sustainable urban development receive adequate financial support in all regions, especially those with the greatest need;

- Develop operational tools that consider the place-based and sociotechnical components of technology-related sustainability transitions to stop the spread of one-size-fits-all mentalities;

- Strengthen scientific cooperation in the field of digitally enhanced teaching and learning to provide government leaders and local authorities with more guidance; and encourage the reframing of national education systems to ensure that digital literacy and digital technologies become a central component of existing and future school curricula, at all levels, from pre-primary schools to universities.

5. Key messages for inclusion into the Ministerial Declaration of the 2022 HLPF.

The Commission proposes six key messages for inclusion into the ministerial declaration of the 2022 HLPF, as follows:

First, industry 4.0 in manufacturing can increase productivity, energy efficiency, and sustainability but very few countries develop and trade Industry 4.0 technologies, which can increase technological gaps between countries.

Second, it is crucial to facilitate international partnerships for mobilizing resources and providing technical assistance in effective policy mixes for incentivizing the adoption of industry 4.0 technologies at the firm level. Collaborative actions could support the participation of actors in the innovation systems of member States in international networks and programmes to build their capacity in innovation regarding industry 4.0.

Fourth, time is ripe for action at the national and international levels to seize the innovation momentum from the pandemic and use the transformative power of science, technology, and innovation to deliver on the commitment to sustainable urban development. The urban sustainability challenges are wide-ranging. Still, there are examples of practical solutions and case studies worldwide in utilizing science, technology, and innovation to tackle these challenges.

Fifth, the significant developments in technology, increase the need for cooperation between nations and stakeholders to ensure that the information society is people-centred, inclusive and development-oriented. It is vital to build common goals in areas such as cybersecurity and artificial intelligence, to ensure that future developments serve humanity and do not threaten harm.

Lastly, the world needs to make use of digital technologies to help reduce carbon emissions, limit the scale of climate change and mitigate already-occurring impacts. The digital policies cannot and should not be separated from the broader goals of environmental impact, economic prosperity and social welfare central to sustainable development.