ITU Contribution to the Implementation of the WSIS Outcomes: 2022

Zero Draft

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I. Introduction

1. The coordination and implementation of the outcomes of the World Summit on the Information Society (WSIS) continues to be one of the priorities of the Secretary-General of the International Telecommunication Union (ITU). The Vision of the Union, as defined in the ITU Strategic Plans for 2020-2023 and 2024-2027, is "an information society, empowered by the interconnected world, where telecommunication/information and communication technologies enable and accelerate social, economic and environmentally sustainable growth and development for everyone", in line with the WSIS Outcome Documents. The Strategic Goals of the Union (Growth, Inclusiveness, Sustainability, Innovation and Partnership) support ITU's role in facilitating progress towards the implementation of the WSIS Action Lines and the 2030 Agenda for Sustainable Development. Through these goals, the Union seeks to contribute to the development of an environment that is conducive to innovation, where advances in new technologies become a key driver for the implementation of the WSIS Action Lines and the 2030 Agenda for Sustainable Development, while also recognizes the need to contribute to the global partnership to strengthen the role of telecommunication/Information and Communication Technologies (ICTs) as means of implementation of the WSIS Action Lines and the 2030 Agenda for Sustainable Development.

2. Two momentous events took place in the year 2015 that have had a direct impact on strategic and operational activities related to the implementation of the WSIS outcomes, namely the:

   - **UNGA Sustainable Development Summit**, 25 - 27 September 2015, which adopted Resolution A/70/1 "Transforming our world: the 2030 Agenda for Sustainable Development";

   - **UNGA High-level Meeting on the overall review of the implementation of the outcomes of the World Summit on the Information Society**, 14-16 December 2015, which adopted Resolution A/70/125 on "Outcome document of the high-level meeting of the General Assembly on the overall review of the implementation of the outcomes of the WSIS".

3. PP-22, which took place in Bucharest from 26 September to 14 October 2022 agreed on a number of key resolutions, including revision of the Resolution 140 that highlights ITU's role in implementing the outcomes of the World Summit on the Information Society and in the overall review by United Nations General Assembly of their implementation.

   a) The revised Res. 140 recalls the pledge in UN General Assembly Resolution 75/1 that "we will improve digital cooperation," along with annual General Assembly resolutions on ICTs for sustainable development and UN Economic and Social Commission (ECOSOC) resolutions on progress in implementing WSIS outcomes.

   b) In nearly two decades since the WSIS outcomes were established, ICTs have fundamentally transformed the world. Revised Res. 140 recognizes that infrastructure developed through investment and competition will increase global connectivity and thus help fulfil WSIS Action Lines and Sustainable Development

Goals. Greater connectivity narrows the digital divide for everyone, including vulnerable groups in remote, rural, unserved, and underserved areas.

c) More recently, the COVID-19 pandemic, while highlighting the critical role of ICTs for the continued functioning of societies, has brought to the fore the significant digital divides between and within countries. In this context, ITU should leverage the WSIS Framework to leave no one offline, despite the setbacks brought about by pandemics.

d) The success of the UN's 2030 Agenda for Sustainable Development will depend on increasing ICT access, connecting the unconnected, and ensuring the inclusion of the marginalised and vulnerable, according to revised Res. 140. While the WSIS process must remain aligned with the 2030 Agenda, the WSIS Forum can provide a platform for reviewing implementation to date.

e) ITU's Member States expressed unanimous support for the WSIS Action Lines to advance the achievement of the SDGs. The PP-22 approved updates to Resolution 140 on ITU's role in implementing the outcomes of the WSIS process that emphasize increasing ICT access, connecting the unconnected, and ensuring the inclusion of the marginalised and vulnerable for the success of the UN's 2030 Agenda for Sustainable Development. While the WSIS process must remain aligned with the 2030 Agenda, the WSIS Forum can provide a platform for reviewing implementation to date.

f) ITU will continue to coordinate with the relevant UN organisations where appropriate, to support the overall review of WSIS Outcomes by UNGA in 2025, and to play an active role in the process according to the ITU's WSIS+20 Roadmap and the review process established by UNGA.

4. During the ITU Plenipotentiary Conference 2022 (PP-22) in Bucharest, Romania, H.E. Mr António Guterres, the Secretary-General of the United Nations, reiterated ''the importance of supporting the World Summit on the Information Society'' and highlighted that ''the International Telecommunication Union has a vital role to play in accelerating global connectivity for all by 2030''.

5. In addition, H.E. Prof Isa Ali Ibrahim (Pantami), Minister, Communications and Digital Economy, Nigeria, and Chairman of the WSIS Forum 2022, organised a side event titled WSIS Process: WSIS Beyond 2025 at the ITU PP-22, which highlighted the role of the WSIS Action Lines in accelerating the achievement of the SDGs, raised challenges, and concluded with reflections on the emerging trends and the learning experience towards the digital future.

6. The latest World Telecommunications/ICT Policy Forum (WTPF-21), the Kigali Declaration from this World Telecommunication Development Conference (WTDC-22), and previous ITU Plenipotentiaries have also called for expanding digital infrastructure and making digital transformation relevant for everyone.

7. The United Nations General Assembly in its ten-year review of WSIS, clearly highlighted the cross-cutting contribution of ICTs to the Sustainable Development Goals (SDGs) and poverty eradication, and called for close alignment between the WSIS process and the 2030 Agenda for Sustainable Development, noting that ICTs can accelerate progress towards all 17 SDGs. The resolution A/70/125 provides guidance on the implementation of the WSIS Outcomes till 2025 and requests all stakeholders to integrate ICTs into their approaches to

implementing the Goals, while requesting UN entities facilitating WSIS Action Lines to review their reporting and work plans to support implementation of the 2030 Agenda.

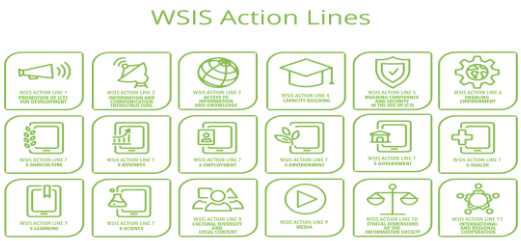
8. Within the ITU, the WSIS implementation and follow up activities of all three Sectors and the General Secretariat are reflected in this annual report titled ITU's Contribution to the Implementation of the WSIS Outcomes. ITU's Contribution to the Implementation of the WSIS Outcomes is a comprehensive report on the ITU activities in context of WSIS carried out by the Union. The Report provides detailed information on the key WSIS related initiatives and activities carried out by the three sectors of the Union (Standardization, Radiocommunication and the Development Sector) and the General Secretariat. The Report provides updates on the tasks carried out by the ITU at the operational and policy level, covering all assigned mandates with reference to the WSIS Process highlighting the linkages between the WSIS Action Lines and SDGs, in particular:

   (a) Lead facilitator (along with UNESCO and UNDP) in coordinating the multistakeholder implementation of the *Geneva Plan of Action*.
   (b) Facilitator of Action Lines C2 (Information and communication infrastructure) and C5 (Building confidence and security in the use of ICTs); upon the UNDP's request the ITU accepted to play the role of the Facilitator of Action Line C6 (Enabling environment).
   (c) Co-facilitator of Action Lines C1, C3, C4, C7 and C11; and partner for Action Lines C8 and C9.
   (d) Rotating Chair of the United Nations Group on Information Society (UNGIS).
   (e) Steering committee member of the Partnership on Measuring ICT for Development.
   (f) Facilitator of the WSIS Stocktaking Process.
   (g) Initiator and facilitator of the WSIS Project Prize.
   (h) Implementer of other WSIS outcomes.

9. Within the ITU, the effective coordination of ITU's strategies and activities in relation to WSIS has been ensured by a WSIS&SDG Task Force that is chaired by the Deputy Secretary-General. Taking into account resolves of Resolution 1332, the terms of reference of the WSIS&SDG Task Force have been amended incorporating coordination on the activities of ITU related to SDGs.

10. This document is divided into six sections. Following the introduction, the second section highlights the alignment between the WSIS Action Lines and the 2030 Agenda for Sustainable Development. The third section provides an overview of ITU activities and projects undertaken in 20212 in the context of the implementation of WSIS Outcomes, while the fourth section informs about ITU's Role in the Overall Review of the Implementation of the Outcomes of the World Summit on the Information Society. The fifth section highlights forums, innovative initiatives and informs about the planned future activities to ensure the full implementation of the WSIS outcomes. The final section provides conclusions of the report.

II. WSIS Action Lines and the 2030 Agenda for Sustainable Development



11. In line with Resolution A/70/1 and Resolution A/70/125, the WSIS Process implementation activities have been aligned with the 2020 Agenda for Sustainable Development, thereby highlighting the direct linkages between WSIS Action Lines and SDGs.

(a) High Level Political Forum (HLPF) 2022[1]

12. The **2022 High Level Political Forum (HLPF**), convened under the auspices of the Economic and Social Council, will be held from Tuesday, 5 July, to Thursday, 7 July, and from Monday, 11 July, to Friday, 15 July 2022, under the theme of "Building back better from the coronavirus disease (COVID-19) while advancing the full implementation of the 2030 Agenda for Sustainable Development".

13. The HLPF will also review in-depth Sustainable Development Goals 4 on quality education, 5 on gender equality, 14 on life below water, 15 on life on land, and 17 on partnerships for the Goals. It will take into account the different impacts of the COVID-19 pandemic across all Sustainable Development Goals and the integrated, indivisible and interlinked nature of the Goals.

14. Through ITU's Liaison Office to the Unites Nations in New York, WSIS Forum contribution and engagement opportunities have also been shared with Missions to the United Nation in New York and the WSIS Forum and WSIS TalkX series have been further promoted to the UN community at UN Headquarters. ITU's Liaison Office also collaborated with the WSIS Forum Secretariat organizing / providing content and speakers for several WSIS TalkX sessions marking UN international days and / or as side events for UN conferences.

(b) WSIS Action Lines and SDG Matrix

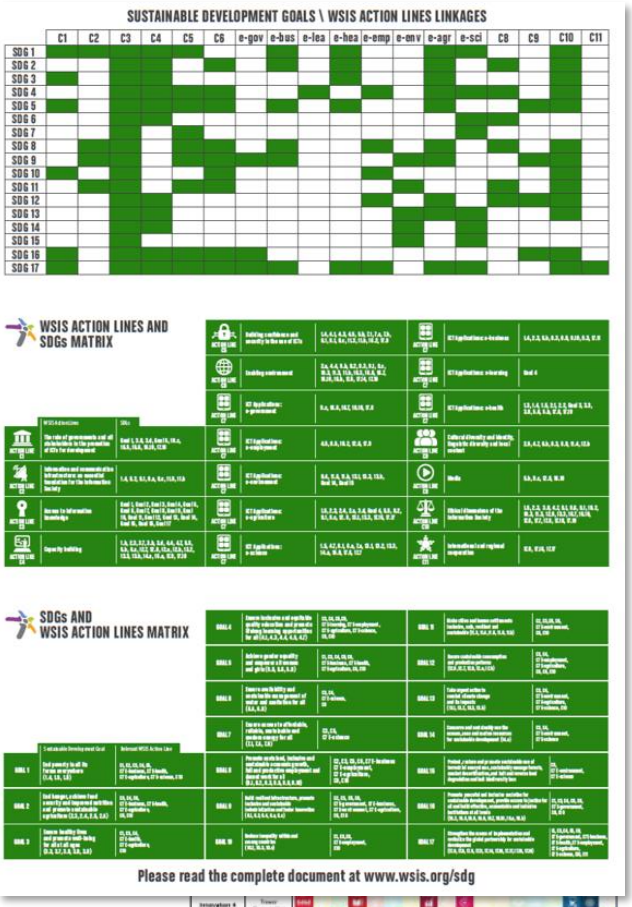
15. At the WSIS Forum 2015, ITU coordinated the **WSIS Action Lines and SDG matrix**, a new tool developed by a number of United Nations agencies to map how ICTs may contribute to the implementation of the new SDGs. The Matrix will serve as an easy reference for stakeholders engaged in shaping the future of both, the SDGs and the WSIS processes beyond 2015 and the 2030 Agenda for Sustainable Development.

[1] The HLPF is the central UN platform for the follow-up and review of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) adopted in 2015.

16. The mapping exercise draws direct linkages of the WSIS Action Lines with the proposed SDGs to continue strengthening the impact of ICTs for sustainable development. Each UN Action Line Facilitator has analyzed the connections and relations of their respective Action Line with the proposed SDGs and their targets. This is a living document and changes can be introduced by Action Line Facilitators, if needed.

17. The goal is to create a clear and direct link and an explicit connection between the key aim of the WSIS, that of harnessing the potential of ICTs to promote and realize the development goals, and the post 2015 development agenda, so as to contribute to the realization of the latter.

18. The WSIS Forum continues to evolve and adapt, by strengthening the synergies between the WSIS Action Lines and SDGs, and taking into account the outcomes of the UNGA Overall Review. In this regard, the annual theme of the WSIS Forum has been aligned with the SDGs process, please read more at www.wsis.org/sdgs



19. **WSIS Forum 2022 Matrix:** The WSIS-SDG Matrix developed by UN WSIS Action Line Facilitators serves as the mechanism to map, analyze and coordinate the implementation of WSIS Action Lines, and more specifically, ICTs as enablers and accelerators of the SDGs. This Matrix builds upon the WSIS-SDG Matrix and provides guidance on the outcomes of the workshops and other sessions held during the Forum, emphasizing linkages between the WSIS Action Lines and SDGs as well as highlighting rational for each linkage that has been established. WSIS Stakeholders identified a clear relation and connection between the WSIS Action Lines and SDGs in their respective workshops. Please read the complete document here.

20. In response to the call by the UN General Assembly within the framework of the ten-year review of the WSIS (Res. A/70/125) calling for a close alignment between the WSIS process and the 2030 Agenda for Sustainable Development, the **WSIS Stocktaking process** highlighted the contribution of 11 WSIS Action Lines to the achievement of 17 SDGs.

21. In this regard, the **WSIS Prizes 2022** contest aligned its rules to highlight the linkages between the WSIS Action Lines and SDGs, this approach will be strengthened in 2023.

I. Overview of ITU activities and projects undertaken since 2022 in the context of the implementation of WSIS Outcomes, also related to the 2030 agenda for Sustainable Development

(a) Lead facilitator (along with UNESCO and UNDP) in organizing the multistakeholder implementation of the *Geneva Plan of Action*.

22. Since 2006, ITU (along with UNESCO and UNDP) has played a leading facilitating role in the implementation of the Geneva Plan of Action (para 109 of the Tunis Agenda). At the international level the cluster of the WSIS related Meetings held every May from 2006 to 2008, and the WSIS Forum has been held every year since 2009. In 2015, the UNGA resolution A/70/125 recognized the WSIS Forum as a platform for discussion and sharing of best practices in the implementation of the World Summit outcomes by all stakeholders, and stated that it should continue to be held annually.

23. At the regional level the Regional Commissions have played a key role in the implementation of the Geneva Plan of Action and reported at the WSIS Forum globally.

24. ITU has contributed annually to the Commission on Science and Technology for Development (CSTD), which has been mandated by ECOSOC to serve as the focal point in the system-wide follow-up to the outcomes of the WSIS. ITU has submitted its inputs to the two priority themes that were addressed during the 2022-2023 CSTD inter-sessional panel meeting held on 25-26 October 2022.

25. ITU has planned, organized, and hosted the WSIS Forum since 2009 in collaboration with the co-organizers, UNESCO, UNCTAD and UNDP. The annual WSIS Forum is a global multistakeholder platform facilitating the implementation of the WSIS Action Lines. The Forum, co-organized by ITU, UNESCO, UNDP and UNCTAD, in close collaboration with all WSIS Action Line co-/facilitators and other UN organizations (FAO, ILO, ITC, UNDESA, UNEP, UNHCR, UNICEF, UNIDO, UNITAR, UNODC, UPU, UN Women, UN Tech Bank for LDCs, UNU, WFP, WHO, WIPO, WMO and UN Regional Commissions), is also an opportunity for information exchange, knowledge creation and sharing of best practices, taking into account the evolving Information and Knowledge Societies. The WSIS Forum provides opportunities for developing multistakeholder and public-private partnerships to advance development goals.

26. The WSIS Forum is a natural evolution of the Cluster of the WSIS related Meetings held every May from 2006 to 2008 organized by the WSIS Action Line facilitations and coordinated by ITU. Since 2009, the WSIS Forum itself has evolved into a unique platform for multistakeholder consensus and discussions on crucial issues concerning the information society. The WSIS Forum results in several documents in particular the WSIS Forum Outcome Document is released on the last day of the Event each year. The agenda, programme and format of the Forum is built in an open multistakeholder consultation process that consists of physical meetings and online consultations. The Forum comprises of a high-level and forum track that include high-level panels, WSIS Action Lines meetings, WSIS Action Line Facilitator's meeting, thematic workshops, and various platforms for networking and initiation of partnerships. More information on the WSIS Action Line Facilitator's meeting here.

27. Please refer to the following for the yearly editions of the WSIS Forum, you can also find the Outcome Documents and the Emerging Trends Document:

    - **Cluster of WSIS Related Events 2006:** http://www.itu.int/net/wsis/implementation/cluster.asp?year=2006&month=0&type='alf'&subtype=0
    - **Cluster of WSIS Related Events 2007:** http://www.itu.int/net/wsis/implementation/cluster.asp?year=2007&month=0&type='alf'&subtype=0
    - **Cluster of WSIS Related Events 2008:** http://www.itu.int/net/wsis/implementation/cluster.asp?year=2008&month=0&type='alf'&subtype=0

    In 2009 the cluster of WSIS related events were rebranded as the WSIS Forum.

    1. **WSIS Forum 2009:** http://www.itu.int/wsis/implementation/2009/forum/geneva/
    2. **WSIS Forum 2010**: http://www.itu.int/wsis/implementation/2010/forum/geneva/
    3. **WSIS Forum 2011**: http://www.itu.int/wsis/implementation/2011/forum/
    4. **WSIS Forum 2012**: http://www.itu.int/wsis/implementation/2012/forum/
    5. **WSIS Forum 2013**: http://www.itu.int/wsis/implementation/2013/forum/
    6. **WSIS Forum 2014**: http://www.itu.int/wsis/implementation/2014/forum/
    7. **WSIS Forum 2015**: http://www.itu.int/wsis/implementation/2015/forum/
    8. **WSIS Forum 2016:** http://www.itu.int/wsis/implementation/2016/forum/
    9. **WSIS Forum 2017:** http://www.itu.int/net4/wsis/forum/2017/
    10. **WSIS Forum 2018:** https://www.itu.int/net4/wsis/forum/2018/
    11. **WSIS Forum 2019:** https://www.itu.int/net4/wsis/forum/2019/
    12. **WSIS Forum 2020:** https://www.itu.int/net4/wsis/forum/2020/
    13. **WSIS Forum 2021:** https://www.itu.int/net4/wsis/forum/2021/
    14. **WSIS Forum 2022:** https://www.itu.int/net4/wsis/forum/2022/

28. At the regional level, each year the regional commissions report on their actions at the annual WSIS-Regional Commissions meeting held at the WSIS Forum. In follow up to the UNGA resolution A/70/125 that invites the regional commissions to continue their work in implementation of the World Summit on the Information Society Action Lines and their contribution to the reviews thereof, including through regional reviews, the regional commissions in collaboration with ITU, UNESCO and UNDP, organizes regional WSIS implementation workshops. The objectives of these workshops are:

    - Building regional capacity on the WSIS Implementation process and its alignment with 2030 Agenda
    - Building awareness on the enabling role of ICTs in sustainable development towards programming of future UNDAFs

- Contributing as regional formal submission to the WSIS Forum Open Consultation Process bringing the regional emerging trends, challenges and opportunities to the global dialogue on WSIS implementation
- Regional reporting on projects to the WSIS Stocktaking
- Identification of possible projects for submission to the WSIS Prize competition
- Regional inputs to the WSIS Action Line facilitation process

29. WSIS Forum 2022 was organised on 15 March 2022 onwards and culminated in a final week at the ITU from 30 May to 3 June 2022 under the overarching theme *ICTs for Well-Being, Inclusion and Resilience: WSIS Cooperation for Accelerating Progress on the SDGs.* The Forum featured a weekly programme, including a series of thematic/country workshops, high-level policy sessions, special tracks on various thematic areas, and a virtual exhibition to address issues that are critical to WSIS implementation and review progress on using ICTs to achieve the SDGs. The final week of the Forum consisted of interactive high-level dialogues, a WSIS Prize ceremony, a ministerial round table as well as the closing ceremony. The WSIS Forum 2022 final week welcomed more than 1,000 physical participants, with more than 30,000 remote participants since 15 March. From 15 March, the Forum hosted over 250 sessions, including thematic workshops, country workshops, WSIS Action Line Facilitation meetings, high-level dialogues, high-level policy sessions, knowledge cafes and open-space talks enabled on-site as well as virtual participants from over 150 countries to engage with more than 500 high-level representatives of the wider WSIS stakeholder community, including Ministers and deputies, Ambassadors, and Leaders from the private sector, academia and civil society. Aligned with both the WSIS Action Lines and the SDGs, this year's programme focused on highlighting the linkages between the two, including SDG priority areas such as indigenous languages, older persons, accessibility, education, youth inclusion, employment, gender empowerment, the environment, infrastructure, and innovation. The Forum provided a platform to celebrate the power of innovation through emerging technologies such as metaverse, AI, IoTs, blockchain, 5G and many others. In addition, a total of over 30 exhibitors highlighting innovation and projects from the ground. The Forum also included the announcement of the WSIS Prizes 2022 winners and champions, which represented all seven continents and all WSIS stakeholder groups. In addition, the winning entries of the WSIS Forum Photo Contest 2022 were unveiled, highlighting how ICTs are playing a vital, enabling role on the road to achieving the SDGs.

30. The Chairman of the WSIS Forum 2022 was H.E. Professor Isa Ali Ibrahim (Pantami), Minister, Federal Ministry of Communications and Digital Economy, Nigeria. The high-level policy sessions were moderated by 11 High-Level Track Facilitators nominated and identified by the different WSIS stakeholder types.

31. With the constant objective of strengthening the alignment of WSIS and SDG processes, the overall theme for WSIS Forum 2022 was *ICTs for Well-Being, Inclusion and Resilience: WSIS Cooperation for Accelerating Progress on the SDGs*. The concrete outcomes of WSIS Forum 2022 are available online here.

32. WSIS Forum 2022 also resulted in a very detailed Outcome Document, which is a compilation of all the outcomes of the different sessions (Action Lines Facilitation Meetings, Thematic and

Country Workshops, Policy Sessions, Information Sessions, Interactive Sessions). The PDF version of this document can be read here.

33. The WSIS Forum 2022 Outcomes linked to WSIS Action Lines SDGs Sustainable Development Goals - Matrix Flyer can be found here.

34. The WSIS Forum 2022 High Level Track Outcomes and Executive Brief can be found here. This document is a compilation of the statements/speeches/briefings delivered at the High-Level Policy sessions of the High-Level Track by high-ranking officials of the WSIS stakeholders community, representing the Government, Private Sector, Civil Society, Academia and International Organizations.

35. The WSIS Stocktaking Report 2022 can be found here. This document reflects around 966 activities relating to ICTs for development, submitted to the WSIS Stocktaking Platform from 1 September 2021 to 21 January 2022, each one highlighting the efforts deployed by stakeholders involved in the implementation of the SDGs. The Report is based on the multistakeholder approach, including input from stakeholders from all over the world responding to ITU's official call in 2022 for Stocktaking updates and new entries. The inputs from WSIS Action Line facilitators and co-facilitators also contributed to the present Report.

36. The WSIS Stocktaking Success Stories 2022 can be read here. This document contains of ICT success stories to best showcase the possible achievement of SDGs, through the implementation of projects related to the WSIS Action Lines.

37. The WSIS Forum 2022: Report – Building back better from the coronavirus disease (COVID-19) while advancing the full implementation of the 2030 Agenda for Sustainable Development can be found here. This document outlines the progress on the implementation of the respective WSIS Action Lines towards the achievement of the SDGs, in particular in line with the theme of the High-Level Political Forum 2022.

38. The WSIS Forum 2022 organised Special Tracks during the Forum, including:

- ICTs and Accessibility for Persons with Disabilities and Specific Needs: the track aims to inform and observe how ICTs can help people living with disabilities whilst focusing on progressing towards the United Nations Sustainable Development Goals.

- ICTs and Youth: WSIS aims to include youth perspectives and engage young people in discussions about how technology can provide opportunities to address some of the world's most pressing issues and provides a platform where youth can offer their insights and understanding of the information society, its challenges and opportunities, and where they can raise questions but also propose solutions to harvesting the power of ICTs towards equally distributed social impact.

- ICTs and Older Persons: the track aims to address the role of technology in achieving healthier ageing but also how technology can help us build smarter cities, combat age-based discrimination at the workplace, ensure financial inclusion of older persons, and support millions of caregivers across the world.

- ICTs and Gender Mainstreaming: the track aims to integrate and mainstream a gender equality perspective through the use of ICTs as well as to strive for 50/50 gender balance

participation at the WSIS Forum 2022. This track comprised interactive sessions with different topics covering gender and ICTs issues.

- Cybersecurity: the track comprised sessions that align with the WSIS Action Line C5: Building Confidence and Security in the Use of ICTs. Cybersecurity is crucial to ensuring universal, trustworthy, and equitable access to connectivity.
- ICTs and Emerging Technologies for sustainable development and ICTs for Industry 4.0: emerging technologies are set to have a vital impact in our future. This track explores how frontier technological solutions address sustainable development challenges and help facilitate innovation in a rapidly changing world.
- ICTs for Well-being and Happiness: this track brought a series of workshops focusing on efforts and success stories to promote healthy lives and well-being for everyone at all ages, in the context of COVID-19 pandemic.
- ICTs and Sports: sport is a one of the most powerful platforms for advancing inclusion and social equality. This special track explores how sport can be harnessed to drive sustainable development and peace, and the ways innovative technologies can advance the world of sport for development.
- ICTs for Developing Countries (and LDCs): this new special track, in collaboration with the UN Technology Bank for Least Developed Countries aims to highlight good practices in the implementation of ICTs within developing and least developed countries, while identifying solutions and opportunities to advance progression towards achieving the UN Sustainable Development Goals.

Photographs: click here.
All WSIS Forum 2022 outcomes, photos and videos documentation and highlights are available at www.wsis.org/forum.

39. The OCP for the WSIS Forum 2022 is structured in five phases, all information including the invitation letters to contribute to the OCP are available here: www.wsis.org/forum.

40. The **WSIS Forum 2023** is scheduled to be held from 13 to 17 March 2023 at the ITU Headquarters premises in Geneva, with the support of remote participation.

(b) Facilitator of the WSIS Action Lines C2, C5, C6

Action Line C2: Information and Communication Infrastructure

Related to the SDGs: SDG 1 (1.4), SDG 8 (8.2), SDG 9 (9.1, 9.a, 9.c), SDG 11 (11.5, 11.b)

41. Within the framework of the existing resources and given mandate, as well as in line with the Geneva Action Plan, the ITU carries out several activities with regard to the WSIS Action Line C2. ITU plans and activities are taking into consideration the approved Resolution 70/1

(Transforming our world: the 2030 Agenda for Sustainable Development) where it was recognized that high-speed broadband is an essential enabler of sustainable development. Another relevant tool is the WSIS-SDG Matrix developed by UN WSIS Action line Facilitators, serving as a mechanism to map, analyze and coordinate the use of ICTs as catalysts for the implementation of the SDGs.

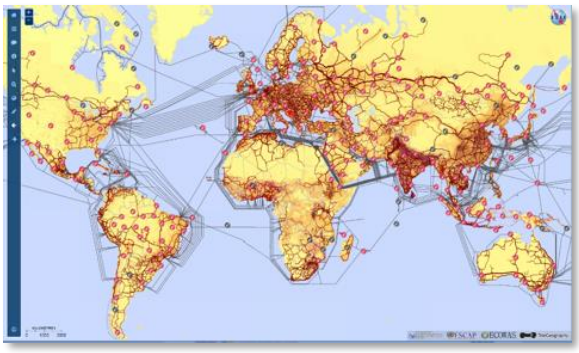
42. The 17th Action Line C2 Facilitation Meeting was held on Monday, 30 May 2022, 16:30-18:15 CEST as an integral part of the WSIS Forum 2022. The title of the Action Line Facilitation meeting was: "Network Innovation for Connecting Remote Communities". The discussion was centred around sustainable innovative solutions for connectivity for unconnected remote communities and low population density areas with the overall objective of evaluating the level of innovation in network architectures for connectivity. More details on this session here.

43. The WSIS Prizes 2022 Winner for the Action Line C2 is **Free Wifi for All in Geographically Isolated and Disadvantaged Areas in Western Mindanao**, the Philippines. Details of the project are available here.

44. ITU-D worked closely with ITU-R and ITU-T in all regions to develop infrastructure and services. Several countries were assisted in preparing wireless broadband master plans, spectrum management master plans and national broadband policies for their transition from public switched telecommunication networks to next-generation networks.

45. ITU Global Development Initiatives are supporting the implementation of SDGs, such as: the m-Powering Development for a Better Tomorrow that is an innovative and unique ITU initiative. The goal is to extend the benefits of mobile telephony to all strata of society, in order to build a truly inclusive information society, with special focus on remote rural and underserviced areas; The Smart Sustainable Development Model initiative aims at linking rural telecommunications development for general communications, business, education health and banking to disaster risk reduction and disaster management initiatives, to ensure an optimal use of technology and avoid duplication of efforts and investments.

46. To identify the global perspective of broadband connectivity that allows the ICT community to identify broadband placement, gaps and evidence-based investment opportunities, the ITU Interactive Transmission Map is continuously adding geospatial data of network links from all regions. The maps are a cutting-edge ICT-data mapping platform to take stock of national backbone connectivity (Optical fiber, Microwave links and Satellite Earth Stations) as well as of other key metrics of the ICT sector, which currently covers all regions of the globe.



47. Implementation and updates of the ITU Interactive Terrestrial Transmission Maps (http://itu.int/go/map-publics) is ongoing. The ITU Maps present critical ICT infrastructure on broadband backbone optical fiber, microwave links, satellite earth stations, and submarine cables. The Map interface was renewed to allow new data visualizations and data analytics. The Maps allow for graphical improvements proposals, wireframes for smartphone and tablet

applications, and dashboard and statistics. Video and demonstrations for events have been developed ready to be deployed.

48. At the time of this reporting, the Map presented information from 600 operator networks. The research on the transmission links has reached 20 million km of routes. Submarine cables, information on IXPs and satellite earth stations have been updated.

49. In order to enhance the Interactive Terrestrial Transmission Map worldwide, ITU coordinated the data collection and validation process covering infrastructure of more than 190 countries. The geospatial is being used to assess connectivity gaps and is feeding different connectivity models from ITU initiatives (e.g. GIGA, C2R, FIGI) to support investment decisions according to user profile (schools, financial inclusion, health centers, etc.)

50. ITU-D has made available a computer program known as SMS4DC (Spectrum Management System for Developing Countries) to assist administrations of developing countries in performing their spectrum management responsibilities more effectively. ITU has kept updating this program and more than 40 countries have subscribed to the tool. Further developments to the SMS4DC are underway covering administrative and radio communication functions. Technical assistance and training programs were provided in this area to several countries and regions.

51. The capacity of ITU members was enhanced on a range of network issues through numerous activities. Direct assistance was provided to multiple countries from all regions in frequency planning, spectrum management master plans, creation of National Table of Frequency Allocations, the transition from analogue to DTTV broadcasting and other technical issues. Some of the examples of such assistance programs are provided below.

52. Assistance on conformity and interoperability has been provided to developing countries. A C&I Assessment Study follow-up for the Caribbean Region targeting young IoT entrepreneurs and the challenges to reach compliance and market.Regional training events have been organized together with testing laboratory partners for AMS, ASP and AFR.

53. Enhanced knowledge in Conformance & Interoperability for Africa with a training held in Ghana, September 2019 (English) and in November 2019 (French). 30 participants from 15 countries participated in the training in Regulatory framework and practical EMC tests. A Training in ITU Centres Of Excellence Network For Asia Pacific Region: Conformity and Interoperability relating to Smart City, 18-21 September 2019, Guangzhou, P.R. China (https://www.itu.int/en/ITU-D/Technology/Pages/CI_Events.aspx). Conformity and Interoperability virtual/online Training Workshop for Africa Region, November 2020

54. The ITU/Craig and Susan McCaw Broadband Wireless Network project is under implementation in Africa covering several countries (Burkina Faso, Burundi, Rwanda, Swaziland, etc.). The wireless broadband connectivity and developing ICT applications will

provide free or low-cost digital access for schools and hospitals, and for underserved populations in rural and remote areas in those countries.

55. The procurement of ICT equipment is under way in Burkina Faso as part of the Broadband Wireless Network project.

56. Broadband Wireless Network for Djibouti was completed for Phase 2 and the maintenance contract was finalized and signed by Djibouti Telecom.

57. Procurement for the Broadband Wireless Network in Mali is in progress. The international call for Proposals has been done. The technical evaluation is following.

58. Basic National Spectrum Management System is to assist developing countries to establish basic structure of spectrum management system. Projects for Comoros, Bolivia and Kyrgyzstan were finished. The results of the assistance are the workplan for countries for implementing/updating their spectrum management structures and activities.

59. IPv6 and IoT (Internet of Things) Expertise Center: The Project document has been signed with MUST (Malaysia University of Science and Technology) to assist developing countries. Following the cooperation agreement between the ITU and Malaysia University of Science (MUST), procurement is under process for the equipment, software and training material as required for the Implementation of an IPv6 and IoT (Internet of Things) in Penang Malaysia. 3 Trainings have been organized.

60. Project to set up IPv6 and IoT expertise centre in Sudan has been signed.

61. In accordance with WTDC Resolution 47 (Rev. Buenos Aires, 2017), regional forums, assessment studies and on-the-job training courses on C&I are planned for 2020 with the participation of several countries in the regions.

62. Several modules of Training material for C&I (CITP) have been prepared and others are under preparation.

63. Capacity of ITU members was built and training programs were organized in such areas as telecommunication/ICT network issues, including conformance & interoperability, digital terrestrial television, IPv6, SMS4DC, spectrum management and allocation, frequency planning and coordination, etc.

64. Direct assistance was provided regarding frequency planning, spectrum management structures and activities, the transition from analogue to digital terrestrial television broadcasting, conformance and interoperability, and future Internet exchange.

65. Furthermore, ITU develops a number of the large scale regional projects focusing on regional initiatives facilitating development of the information and communication infrastructure. More information on these projects as well as the other projects can be found ITU-D Projects webpage.

66. In the framework of ITU-D Study Groups, the following questions related to AL-C2 were approved by WTDC-17 with working mandate until 2021:

1) *Question 1/1: Strategies and policies for the deployment of broadband in developing countries*
2) *Question 2/1: Strategies, policies, regulations and methods of migration and adoption of digital broadcasting and implementation of new services*
3) *Question 5/1: Telecommunications/ICTs for rural and remote areas*
4) *Question 4/2: Assistance to developing countries for implementing conformance and interoperability (C&I) programmes and combating counterfeit ICT equipment and theft of mobile devices*
5) *Question 7/2: Strategies and policies concerning human exposure to electromagnetic fields*

The Final Reports and Guidelines from the ITU-D Study Groups for the 2014-2017 study period are available for download and viewing in different accessibly formats in the six official languages (link to ITU-D SG1 Reports and link to ITU-D SG2 Reports).

As an input document to Question 1/1 and Question 2/1 in the 2014-2017 cycle, ITU has contributed with a Report on Implementation of Evolving Telecommunication/ICT Infrastructure for Developing Countries: Technical, Economic and Policy Aspects. The report introduces essential telecommunication/ICT infrastructures and their technologies, economic and policy aspects supporting effective adoption of Next-generation Networks, and it is available online. ITU Toolkit on Business Planning for ICT Infrastructure development was prepared and a training based on this toolkit is running in 26 October-11 December 2020.

67. ITU is contributing to bridging the standardization gap between developing and developed countries. Instructed by PP-14 Resolution 123, WTSA-20 Resolution 44, and the new WTDC-14 Recommendation 22 on Bridging the Standardization Gap (BSG), regional workshops and other regional activities are receiving support from ITU Regional Offices to improve awareness, understanding and participation on the development of ICT standards developed by global and regional Standardization Development Organizations (SDOs).

68. In the implementation of Action Line C2, ITU continues to be at the forefront of providing global standards for telecommunication in areas such as broadband access and home networks and infrastructures for ultra-high-speed transport; as well as future networks including 5G and networking innovations in fields such as network slicing, fixed mobile convergence, information centric networking, software-defined networking, machine learning as applied to 5G, cloud computing, data management, and trusted network infrastructure. Since 1 November 2020, ITU-T approved more than 200 texts (as of 15 September 2021), including ITU-T Recommendations, Supplements and Technical Reports.

69. The ITU Last Mile Connectivity Solutions Guide was developed to help accelerate actions to address last-mile Internet connectivity issues in situations that include a lack of network infrastructure and with a view to encouraging more affordable service delivery. The tools, service interventions and policy solutions reflect how to extend Internet access to areas and users in geographies without Internet while considering their unique characteristics. The Solutions Guide is designed for use during initial consultations on how to address these gaps and includes reference materials, resources and links to other content to support the process, dialogue and decision-making that accompanies intervention design.

70. To complement this Solutions Guide, a range of resources is developed to help Member States address last-mile connectivity challenges, including a database of case studies (LMC Case Studies Database) and capacity-development courses on last mile connectivity. In addition, interactive last-mile connectivity diagnostic and decision-making tools are being developed that includes methodologies for technology selection and cost estimation for building broadband access networks in localities or connecting schools, hospitals or other specific objects to broadband transport backbones.

71. Emerging technology trends: Artificial intelligence and big data for development 4.0: contains hands-on guidelines for policy-makers and other stakeholders in crafting a national AI and data strategy for development. The report also identifies the main building-blocks of a national AI and data system for development (governance; regulation; ethics; digital and data skills; the digital environment and data infrastructure; the innovation system; AI and data-intensive sectors; and international collaboration).

72. ITU's Emerging Technology for Connectivity 2021 was held from July 5 to July 16 2021 with about 25 sessions and 595 total present participants. It featured about 154 speakers. In addition, capacity development activities were conducted with 5 training courses. The presentations, recordings and reports are available on the event website.

73. New graphical interface of the ITU Interactive Transmission Maps is under development.

74. Results of ITU-T study groups on Action Line C2 are:

    - **ITU-T E.803 (revised) "Quality of service parameters for supporting service aspects"** deals with the quality of service (QoS) parameters that could be of primary interest and concern to the customers and users of ICT services who wish to compare performances of service providers (SPs) of ICT services during the non-utilization stages of such services and secondarily to regulators and service providers.
    - **ITU-T F.743.13 "Requirements for cooperation of multiple edge gateways"** describes the requirements for a function which enables the cooperation of multiple edge gateways (CMEG) to complete complex tasks. It also describes the required capabilities and requirements of key components. The CEMG function can support the information exchanging among multiple edge gateways and deal with gateway failure cooperatively. It can also specify the central gateway which is responsible for selecting a cooperative gateway for each gateway, which in turn monitors the status of its partner gateway, and manages the cooperative data and devices.
    - **ITU-T F.743.14 "Requirements for video distribution systems"**: Video distribution system is an Internet application system which is built based on the underlying content delivery network, and can provide the video collection, distribution and viewing functions for the Internet users without any system development. This Recommendation describes the requirements and application scenarios for video distribution system.
    - **ITU-T F.743.15 "Requirements for multi-operator core network enabled multimedia services"** specifies the requirements for Multi-operator Core Network (MOCN) enabled multimedia services (MOCN-MS). This Recommendation not only defines a high-level functional framework of MOCN enabled multimedia services, but also specifies the Sharing Capability Information Unit (SCIU) function requirements and MOCN-MS system

requirements according to this framework. In addition, several scenarios for MOCN enabled multimedia services are provided in this Recommendation. MOCN enabled multimedia service defined in this Recommendation can improve the conventional multimedia service quality by taking advantage of the network sharing capability of the Co-construction network, without bring any additional impact on the base station. The MOCN enabled multimedia service providers will be benefit from the requirements and reference framework defined in this Recommendation so that the extension and optimization of the existing multimedia service can be estimated efficiently. In addition, it is possible for the multimedia service provider to discover and develop the new features while the MOCN-MS is employed.

- **ITU-T F.743.16 "Requirements for communication resource management in intelligent visual surveillance system"** defines the architecture and specifies requirements for communication resource management in IVS system, including the requirements of communication resource monitoring, resource provisioning and resource scheduling. Communication resource management in IVS system aims to make rational use of communication resources, so that it can complete the tasks which are generated by the IVS system efficiently.
- **ITU-T F.743.17 "Requirements for cloud gaming system"** describes the requirements for cloud gaming system including user requirements, service requirements, performance requirements, management requirements, security requirements, network requirements and terminal requirements for cloud gaming system. It also describes the typical scenarios including cloud game distribution scenario, cloud game running scenario, cloud game cross-platform scenario and cloud game live streaming scenario for cloud gaming system in the Appendix. This Recommendation is intended to provide a reference for cloud gaming service providers, platform providers and developers when they build and operate a cloud gaming system.
- **ITU-T F.746.12 "Requirements for a real-time interactive multimedia service under poor network conditions"** describes the scenarios, general framework, and requirements for a real-time interactive multimedia service (RIMS) under poor network conditions. The RIMS system plays an important role in many scenarios and situations, e.g., emergency relief, remote education and emergency communication. The RIMS requires providing measures for adjustment of coding parameters, including video and audio coding parameters, dynamically, and it requires setting maximal priority of audio communication under low-speed network conditions and configuring usage priority attributes to ensure that high-priority uses have priority of service over low-priority uses.
- **ITU-T F.746.13 "Requirements for smart speaker based intelligent multimedia communication system"** defines the requirements of intelligent multimedia communication for varied types of smart speakers, including the reference architecture, requirements of smart devices, requirements of signalling and platform, as well as a few typical scenario examples. This Recommendation specifies the requirements to eliminate the difference in multimedia communication and access management of heterogeneous devices, to simplify the construction complexity of intelligent multimedia communication system, to improve the security and reliability of signalling and multimedia data transmission between smart speakers and the intelligent multimedia communication system, to finally guarantee high-qualified multimedia communication service.

- **ITU-T F.747.10 "Requirements of distributed ledger systems for secure human factor services"** provides general requirements and functional capabilities for distributed ledger systems (DLS) for secure human factor services. This Recommendation describes the requirements for the secure human factor distributed ledger service model, which can solve conflicting goals of privacy protection and big personal human factor data utilization. This Recommendation also includes the functional capabilities for human factor distributed ledger shared nodes to perform machine learning without decryption on encrypted human factor data. However, the computational burden of machine learning for encrypted data may be excessive. To solve this problem, this human factor distributed ledger service model provides procedures for allowing the use of two or more encryption key pairs and notifying the key type. In addition, this Recommendation involves the integrity maintaining requirements for secure human factor services to maintain a safe distributed ledger and checked from the beginning to distribute personal human factor information. Therefore, the application of distributed ledger system in the distribution of personal secure human factor information can ensure transparent tracking from the distribution process to the final use path.
- **ITU-T F.748.14 "Requirements and evaluation methods of non-interactive 2D real-person digital human application systems"** specifies the requirements and evaluation methods of non-interactive 2D real-person digital human application systems, in terms of image, voice, movement, display, etc. It can be used to guide relevant parties to test, select or evaluate the non-interactive 2D real-person digital human application system. The evaluation methodology can reflect the current state of non-interactive 2D real-person digital human application system by providing meaningful comparison dimensions.
- **ITU-T F.748.15 "Framework and metrics for digital human application systems"** is for the digital human application system, which specifies the framework of the digital human application system, and the corresponding subjective and objective metrics are accordingly proposed from the dimensions of image, speech, animation, interactive processing and multimodal I/O. This Recommendation can be used to guide relevant parties to test, select or evaluate the digital human application system. The metrics can reflect the current state of the digital human application system by providing meaningful comparison dimensions.
- **ITU-T F.748.16 "Requirements for machine vision-based applications and services in smart manufacturing"** presents the overview and requirements for machine vision-based applications and services in smart manufacturing. It describes basic concept, scenario and ecosystem of machine vision, and identifies several typical requirements which are data acquisition, data pre-processing, data processing and etc. This Recommendation also gives reference model for machine vision-based applications and services in smart manufacturing. The general goals of standardization for machine vision service are:

  – Define the requirements of machine vision-based services and applications

  – Help ender users and providers to specify the machine vision tasks and the solutions.

  – Enhance confidence in machine vision ecosystem and open new applications for machine vision system.

- **ITU-T F.749.15 "Requirements for inspection and examination services using civilian unmanned aerial vehicles"**: There are many requirements for careful inspection and examination of specific objects / facilities and surroundings, such as power lines, oil pipelines, bridges and viaducts on water and land, rivers and lakes, or inspection the emergency disaster scene, etc. With the help of high-definition cameras, panoramic camera and other sensors (such as infrared sensors), the civilian unmanned aerial vehicle (CUAV) can easily help accomplish the inspection and examination job quickly, efficiently with high quality. This Recommendation specifies the requirements for high definition and virtual reality inspection and examination services by human being using CUAV, including the requirements for fore-end devices capturing HD images and videos of objects and surroundings, network communication, service and application support as well as service presentation and playback.
- **ITU-T F.751.3 "Requirements for change management in DLT-based decentralized applications":** The development of applications using distributed ledger technology (DLT) enables the creation of new business models in various sectors of the economy and it has the potential to tackle, on a large scale, important challenges for our society, due to its ability to increase trust in the relationship among stakeholders. Technical immutability is key to build trust among stakeholders. On the other hand, real-life introduces practical needs to update applications with smart contracts. This document defines some recommendations to tackle changes in applications using smart contracts. The discussion of whether DLT networks provide different levels of technical immutability is out of scope of this document.
- **ITU-T F.751.4 "General framework for DLT-based invoices"**: DLT-based invoice is an invoice that can be issued, transferred and received in a structured electronic format over digital ledgers which allows for its automatic, electronic transactions based on the smart contracts. It presents as a novel invoice service category, emerges as a promising solution to tackle the challenges by leveraging the capability of distributed ledger technology and the trust requirement of the stakeholders in the ecosystem. The usage of DLT-based invoices is driven mainly by seeking to optimize the end-to-end trustworthy business process across the jurisdictions in the major processes, e.g., issuance, routing, processing, re-imbursement, auditing and so on. The document is not proposing a "regulatory" framework. However, tax consideration involved by nature regulatory considerations must be addressed at a national level and are not the subject of this Recommendation. The electronic exchange of the invoice content between trading partners' accounts receivable and accounts payable business processes is to be recorded over the invoice digital ledger in trustworthy way with local tax compliance. From a technology perspective, it needs to determine how the invoice will be transferred in a secure and interoperable way and how policies in different jurisdiction is enforced, and in the meanwhile the data privacy, security, trust and confidentiality have to be guaranteed, which is relevant to the following aspects:

  – Secure messaging infrastructure to ensure that senders and receivers can trust the system and confidently exchange invoices.

  – Programmable government tax policies that can be securely enforced.

  – Invoice data validation schemes to ensure that integrity of the invoice content.

Immutability of the digital distributed ledgers to allow stakeholders to store, validate the invoice based on their corresponding privileges.

- **ITU-T F.780.2** "Accessibility of telehealth services" defines use cases and requirements for accessible telehealth services, which is result of collaboration between ITU and the World Health Organization (WHO). The official launch of the joint ITU & WHO standard was on 16 June 2022 during the Conference for States Parties for the Convention on the Rights of Persons with Disabilities (COSP).

- **ITU-T G.191 (revised) "Software tools for speech and audio coding standardization"** provides source code for speech and audio processing modules for narrowband, wideband and super-wideband telephony applications. The set includes codecs, filters, noise generators. This edition introduces changes to Annex A, which describes the ITU-T Software Tools (STL) containing a high-quality, portable C code library for speech processing applications. This release of the STL, also known as STL2022, incorporates:
  - An implementation of ESDRU (energy-based spatial distortion reference unit) as described in ITU-T P.811.
  - An implementation of the loudness measurement algorithm as in ITU-R Rec. BS.1770-4.

  Recommendation ITU-T G.191 includes an electronic attachment containing STL2022 and manual.

- **ITU-T G.709/Y.1331 Amd.2 "Interfaces for the optical transport network - Amendment 2"** adds specifications for OTUk, k=0, references to specific bit patterns that may appear in Status and Payload Type overhead fields during the presence of the FlexO Squelch text pattern [ITU-T G.709.1], a clarification of the ODU Locked maintenance signal and an enhancement of the introductory text in Annex L.

- **ITU-T G.781.1 "Synchronization layer functions for packet-based synchronization"** specifies a functional architecture model and corresponding atomic functions for the transport of time and frequency synchronization via packet-based methods using PTP.

- **ITU-T G.798 Amd.4 "Characteristics of Optical Transport Network Hierarchy Equipment Functional Blocks - Amendment 4"** adds new and modified atomic functions to align with the recent changes to ITU-T Recommendations G.709.1 and G.709.3, and to align with ITU-T Recommendation G.709 Amendment 2, including the introduction of OTU0. It corrects a number of technical errors in the FlexO-x/OTUCn_A, FlexO-x/OTUCni_A, OTU/ODU_A, and OTSi/OTUk-RS_A functions, as well as in the description of some generic FlexO-related processes in clause 8.5.

- **ITU-T G.873.1 Amd.1 "Optical transport network: Linear protection - Amendment 1"** adds ODUCn as a server layer of protected entities in Table 8-1 and provides minor editorial changes.

- **ITU-T G.984.5 (revised) "Gigabit-capable passive optical networks (GPON): Enhancement band"** defines wavelength ranges reserved for additional service signals to be overlaid via wavelength division multiplexing (WDM) in passive optical networks (PON) for maximizing the value of optical distribution networks (ODNs).

- **ITU-T G.988 Amd.5 "ONU management and control interface (OMCI) specification - Amendment 5"** adds:

    - Support of High Speed PON (HSP)
    - Support of User Services Platform (USP).

- **ITU-T G.994.1 Amd.1 "Handshake procedures for digital subscriber line transceivers - Amendment 1"** includes the following new material
  – Add codepoints for the support of G.fastback Recommendation.
- **ITU-T G.997.2 Amd.3 "Physical layer management for G.fast transceivers - Amendment 3"** integrates the Amendment 1 and 2 of ITU-T Rec. G.997.2 and includes the following new material:
  – Managed objects for RMCR.
  – Annex X, Annex D and Annex T of ITU-T G.9701 diagnostics and monitoring objects
  – A new Annex B containing additional managed object for the support of G.9702.

  In addition, it corrects the following items:
  – A typological inconsistency in the naming of the persistency managed objects.
- **ITU-T G.997.3 Amd.1 "Physical layer management for MGfast transceivers - Amendment 1"** adds the following new material:
  – Annex D and Annex T of ITU-T G.9711 diagnostics and monitoring objects.

  In addition, it corrects the following items:
  – The description of the RMCR success counters in Table 7-9.
  – A typological inconsistency in the naming of the persistency managed objects.
- **ITU-T G.1023 "Framework for capacity assessment of packet data services in mobile networks"** provides a framework for capacity assessment of packet-data services in mobile networks. Mobile-network capacity is an underlying factor in all QoS aspects of a packet-data based mobile network due to the shared-resource properties of such networks. It is therefore desirable to achieve a basic understanding of related properties and corresponding performance indicators. Measuring network capacity takes, however, significantly more effort and resources, in the sense that a direct measurement of capacity requires a massive effort in terms of resources, which practically creates the requirement to use assessments. This Recommendation therefore provides a systematic approach to describe and characterize methods for assessment of packet-data based mobile networks, and presents the respective framework. Spatial resolution is an important element of this framework, i.e. the recognition that network capacity is not a quantity which is uniform over the entire network, or large areas of it. Rather, due to the cellular nature of such networks, capacity, and therefore also QoS and QoE properties, are spatially different.
- **ITU-T G.1036 "Quality of experience (QoE) influencing factors for augmented reality (AR) services"** lists typical use cases of augmented reality services and identifies the key QoE factors in it, and also gives a suggested scheme for AR QoE assessment in future works.
- **ITU-T G.7701 (revised) "Common control aspects"** describes the concepts and the aspects of management control components that are common to the use of either software defined networking (SDN) and automatically switched optical network (ASON)

approaches to the management of a transport network. It also describes the common aspects of the interaction between the management-control functions and the transport network resources.

- **ITU-T G.7702 (revised) "Architecture for SDN control of transport networks"** describes the reference architecture for software defined networking (SDN) control of transport networks applicable to both connection-oriented circuit and/or packet transport networks. This architecture is described in terms of abstract components and interfaces that represent logical functions (abstract entities versus physical implementations).
- **ITU-T G.7711/Y.1702 (revised) "Generic protocol-neutral information model for transport resources"**: The 2021 edition of this Recommendation has added the new Annex M the Party model, new Annex N the Location model, new Annex Q the Foundation – State, and has significant improvement to the model structure so the UML model is aligned with the documents. The modeling tool has been up-versioned to Eclipse 4.13.0 (2019-09) and Papyrus 4.5.0.
- **ITU-T G.7712/Y.1703 Amd.1 "Architecture and specification of data communication network - Amendment 1"**: Recommendation ITU-T G.7712/Y.1703 defines the architecture requirements for a data communication network (DCN) which may support distributed management communications related to the telecommunication management network (TMN), distributed control communications (e.g., signalling and routing) related to the automatically switched optical network (ASON), distributed control communications (e.g., signalling and routing) related to multiprotocol label switching – transport profile (MPLS-TP), control communications related to software defined networking (SDN), and other distributed communications (e.g., orderwire or voice communications, software download). The DCN architecture considers networks that are IP only, open system interface (OSI)-only, and mixed (i.e., support both IP and OSI). The interworking between parts of the DCN supporting IP-only, parts supporting OSI only, and parts supporting both IP and OSI are also specified – other protocols (other than IP or OSI) are outside the current scope of this Recommendation.

  Various applications (e.g., TMN, ASON) require a packet-based communications network to transport information between various components. For example, the TMN requires a communications network, which is referred to as the management communication network (MCN) to transport management messages between TMN components (e.g., network element function (NEF) component and operations system function (OSF) component). ASON requires a communication network, which is referred to as the control communication network (CCN), and MPLS-TP requires a communication network, which is referred to as the signalling communication network (SCN) to transport signalling and routing messages between functional management and control (MC) components (e.g., connection controller (CC) components and routing controller (RC) components). This Recommendation specifies data communication functions that can be used to support one or more application's communication network.

  This Recommendation forms part of a family of Recommendations covering transport networks.
- **ITU-T G.7721.1 "Data model of Synchronization management"** specifies the synchronization information models and data models for Transport Network Element (NE) to support specific interface protocols and specific management and control (MC)

functions. The information models are interface protocol neutral and specified using the Unified Modelling Language (UML). The data models are interface protocol specific and are directly derived from these information models. The specific data models considered in this Recommendation include, but are not limited to, YANG data models. The specific MC functions for synchronization covered by this Recommendation are specified in [ITU-T G.8265.1], [ITU-T G.8275.1] and [ITU-T G.8275.2]. The PTP telecom profile YANG module defined in this Recommendation augments the PTP YANG module defined in [IETF RFC 8575] for the management of the Precision Time Protocol (PTP) defined in [IEEE 1588-2008]. The UML information model and YANG data model in this version of the Recommendation covers the PTP telecom profiles defined in [ITU-T G.8265.1] Edition 2.2 (08/2019), [ITU-T G.8275.1] Edition 3.0 (03/2020), and [ITU-T G.8275.2] Edition 2.0 (03/2021), which are based on [IEEE 1588-2008].

- **ITU-T G.8012/Y.1308 (revised) "Ethernet UNI and Ethernet NNI"** specifies the Ethernet UNI and the Ethernet NNI. A set of physical Ethernet interfaces is defined for the Ethernet UNI and the Ethernet NNI. Further, an Ethernet over Transport interface is defined for the Ethernet NNI. The Ethernet over Transport NNI uses the OTH server layer network. This Recommendation supersedes ITU-T Recommendation G.8012.1/Y.1308.1 (12/2012), and together with ITU-T Recommendation G.8021/Y.1341, supersedes ITU-T Recommendation G.8021.1/Y.1341.1 (10/2012). This Recommendation also removes items formerly considered for further study and incorporates terms formerly defined in ITU-T Recommendation G.8001/Y.1354 (04/2016) and in ITU-T Recommendation G.8101/Y.1355 (11/2016).
- **ITU-T G.8021/Y.1341 (revised) "Characteristics of Ethernet transport network equipment functional blocks"** specifies both the functional components and the methodology that should be used in order to specify the Ethernet transport network functionality of network elements; it does not specify individual Ethernet transport network equipment. This Recommendation, together with Recommendation ITU-T G.8012/Y.1308, supersedes Recommendation ITU-T G.8021.1/Y.1341.1 (10/2012). This Recommendation also removes items formerly considered for further study and incorporates terms formerly defined in ITU-T Recommendation G.8001/Y.1354 (04/2016).
- **ITU-T G.8023 Amd.1 "Characteristics of equipment functional blocks supporting Ethernet physical layer and Flex Ethernet interfaces - Amendment 1"** contains various text modifications.
- **ITU-T G.8312 Amd.1 "Interfaces for metro transport networks - Amendment 1"** specifies the rates and formats for use in metro transport network (MTN) digital layer networks: the MTN path (MTNP) layer and the MTN section (MTNS) layer, which support the transport of distributed radio access network (D-RAN) and centralized radio access network (C-RAN) traffic.
- **ITU-T G.8265.1/Y.1365.1 Amd.1 "Precision time protocol telecom profile for frequency synchronization - Amendment 1"** includes several changes.
- **ITU-T G.8271.1/Y.1366.1 Amd.2 "Network limits for time synchronization in packet networks with full timing support from the network - Amendment 2"** provides some updates:

- **ITU-T G.8273.2/Y.1368.2 Amd.1 "Timing characteristics of telecom boundary clocks and telecom time slave clocks for use with full timing support from the network - Amendment 1"** provides several updates.
- **ITU-T G.8275/Y.1369 Amd.2 "Architecture and requirements for packet-based time and phase distribution - Amendment 2"** incorporates updates to Appendix III Generic IWF node.
- **ITU-T G.8275.1/Y.1369.1 Amd.3 "Precision time protocol telecom profile for phase/time synchronization with full timing support from the network - Amendment 3"** provides several updates.
- **ITU-T G.8275.2/Y.1369.2 Amd.3 "Precision time protocol telecom profile for phase/time synchronization with partial timing support from the network – Amendment 3"** provides several updates:
- **ITU-T G.8331 "Metro transport network (MTN) linear protection"** defines the operation of linear protection switching schemes for the Metro Transport Network (MTN) path layer, including the automatic protection switching (APS) protocol.
- **ITU-T G.9701 (2019) Amd.4 "Fast access to subscriber terminals (G.fast) – Physical layer specification: Amendment 4"** includes support for DTA diagnostics and monitoring, adds RMCR monitoring primitives, and corrects various deficiencies.
- **ITU-T G.9702 "Transceiver and system specifications for backhaul applications based on G.fast"** specifies means to support Distribution Point Unit - Fast Backhaul (DPU-FB), which uses the G.fast technology for both the backhaul connections (back lines) and the connections to the G.fast NTs (front lines) in an environment where crosstalk cancelling between the wire-pairs of the back lines and wire-pairs of the front lines is required in addition to the FEXT cancellation provided by G.fast.
- **ITU-T G.9711 Amd.1 "Multi-gigabit fast access to subscriber terminals (MGfast) – Physical layer specification"** provides additional specifications or corrections.
- **ITU-T G.9803 Amd.2 "Radio over fibre systems - Amendment 2"** develops a new type of optical access network based on radio-over-fibre (RoF) technologies. This Recommendation describes a fundamental architecture and requirements for RoF systems. This Recommendation specifies the system overview, physical layer requirements, system requirements and co-existence with passive optical network (PON) for analogue RoF systems supporting the international mobile telecommunication (IMT) system over optical distribution network (ODN). This Recommendation also describes the system overview and physical layer requirements for analogue RoF systems supporting the foreign object debris (FOD) detection system.
- **ITU-T G.9805 "Coexistence of Passive Optical Network Systems"** presents three methods for the coexistence of multiple PON generations on a common ODN: Coexistence element (CE), multi-PON module (MPM), and splitter-based. These allow the reuse of already deployed fibre and splitters when evolving a legacy PON to a higher capacity. Methods for calculating required isolation for Coexistence element, filter considerations for HSP and XG(S)-PON OLT, and optical interface parameters for GPON/XG(S)-PON MPM supporting Class B+, C+ and D OPL are also described.

- **ITU-T G.9960 Amd.3 "Unified high-speed wire-line based home networking transceivers - System architecture and physical layer specification - Amendment 3"** corrects the duration of MSG, BMSG and BACK frames, corrects a test vector in clause G.4.1, and reserves PROBE frame and BACK PHY-frame type field values for use by ITU-T G.9963.
- **ITU-T G.9961 Amd.4 "Unified high-speed wireline-based home networking transceivers – Data link layer specification - Amendment 4"** includes enhancements to the secure admission methods, extends the maximum MAC cycle duration for operation over powerlines (to support Smart Grid applications), and provides updates to account for revisions to IEEE 802.1Q.
- **ITU-T G.9976 "Support UHD video service over G.hn"** studies the specificities of transmission of UHD video service over G.hn. This document provides analysis on typical deployment of UHD video types in home network, typical scenarios (including network topology, medium usage, support endpoints, etc.), and network requirements.
- **ITU-T G.9978 Amd.1 (revised) "Secure admission in G.hn network"** adds support for native authentication and external authentication, as specified in [ITU-T G.9961].
- **ITU-T G.Suppl.77 "Influencing factors on quality of experience (QoE) for video customized alerting tone (CAT) and video customized ringing signal (CRS) services"** describes video customized alerting tone (CAT) and video customized ringing signal (CRS) services and helps to identify the QoE key factors of video CAT and CRS.
- **ITU-T H.551 "Architecture of vehicular multimedia systems"** defines the configuration for vehicle multimedia systems (VMSs), the reference model of VMS architecture, and the reference solution for VMS multimedia applications. VMS security issues and personally identifiable information protection and privacy issues are also described.
- **ITU-T H.626.5 (V2) (revised) "Architecture for intelligent video surveillance systems"** defines an architecture for intelligent video surveillance systems, including the functional requirements, functional architecture and reference points. The intelligent video surveillance system provides intelligent analysis capabilities and services for users based on the images, video slices or video streams from surveillance cameras. Meanwhile, the system also aggregates and stores the video and image information from the intelligent analysis, the surveillance devices, or manual annotation. Based on these aggregation and storage, the system provides application services and sharing services for users through the network, such as query and retrieval about the video and image information, subscription and notification, etc. This Recommendation is based on Recommendation ITU-T F.743.1, "Requirements for intelligent visual surveillance". This edition updates the title, functional architecture, delete the service control flow and signaling, as well as revising the references points.
- **ITU-T H.627.2 "Requirements and protocols for home surveillance systems"** defines the requirements and protocols for IP based network access of varied types of equipment under home security surveillance scenarios including the architecture, protocol for transmission, access and service functions as well as other relevant requirements under the home surveillance considerations. This Recommendation specifies a way to eliminate the difference in network communication and access management of heterogeneous devices, to simplify the construction complexity of home security platforms, to improve the security and reliability of data transmission between home security equipment and

the home surveillance platform, and finally to guarantee high-qualified development of home surveillance service.

- **ITU-T J.198.1 "Functional requirements for third-generation HiNoC"** describes the third generation HiNoC which provides 10 Gbit/s data transmission over coaxial network in cable industry. This document contains descriptions for functional requirements of general system, physical layer and MAC layer.
- **ITU-T J.1026 (revised) "Downloadable conditional access system for unidirectional networks – Requirements"** specifies requirements for one-way downloadable conditional access system (DCAS) for unidirectional networks. One-way DCAS protects broadcast content/services and controls consumer entitlements like traditional conditional access (CA) systems, and enables a terminal, such as a set-top-box (STB), to adapt to a new CA system by downloading and installing the new CA system's client without changing the hardware. In particular, one-way DCAS can fully work in unidirectional cable TV networks and other unidirectional networks such as satellite TV networks.
- **ITU-T J.1027 (revised) "Downloadable conditional access system for unidirectional networks - System architecture"** specifies a system architecture for a one-way downloadable conditional access system (DCAS) for unidirectional networks. One-way DCAS protects broadcast content/services and controls consumer entitlements like traditional conditional access (CA) systems, and enables a terminal, such as a set-top-box (STB), to adapt to a new CA system by downloading and installing the new CA system's client without hardware changing. In particular one-way DCAS can fully work in unidirectional cable TV networks and other unidirectional networks such as satellite TV networks.
- **ITU-T J.1028 (revised) "Downloadable conditional access system for unidirectional networks - Terminal system"** specifies a terminal for a one-way downloadable conditional access system (DCAS) for unidirectional networks. One-way DCAS protects broadcast content/services and controls consumer entitlements like traditional conditional access (CA) systems and enables a terminal, such as a set-top-box (STB), to adapt to a new CA system by downloading and installing the new CA system's client without hardware changing. In particular one-way DCAS can fully work in unidirectional cable TV networks and other unidirectional networks such as satellite TV networks.
- **ITU-T J.1201 (revised) "Functional requirements of a smart TV operating system"** specifies the functional requirements of a smart TV operating system over integrated broadcast and broadband cable networks. A smart TV operating system is intended to be installed in an integrated broadcast and broadband (IBB) capable cable set-top box (STB) and TV and to enable broadcasting and IP-based interactive services provided by cable television operators and third party providers. By running a smart TV operating system, the IBB-capable cable STB and TV will be able to intelligently provide subscribers with advanced and personalized services by downloading and installing advanced and personalized apps from cable operators' platforms and third party platforms, which are interconnected with the related cable operators' platforms. This Recommendation is the first of a series of smart TV operating system Recommendations. The Recommendations for this smart TV operating system will cover functional requirements, architecture, security and application programming interfaces (APIs).

- **ITU-T J.1202 (revised) "The architecture of a smart TV operating system"** defines the architecture of a smart television TV operating system (TVOS) to enable integrated broadcast and broadband (IBB)-capable cable set-top box (STB) and TV to apply to broadcasting services and IP-based interactive services provided by cable television operators and third-party providers. By running the smart TV operating system, the IBB capable STB and TV will be able to provide subscribers with advanced and personalized services by downloading and installing advanced and personalized apps from cable operators' platforms and third-party platforms, which are interconnected with the related cable operators' platforms.
- **ITU-T J.1203 (revised) "The specification of a smart TV operating system"** defines the detailed specification of a smart TV operating system (TVOS) to enable integrated broadcast and broadband (IBB)-capable cable set-top box (STB) and TV to apply to broadcasting services and IP-based interactive services provided by cable television operators and third-party providers. By running the smart TV operating system, the IBB capable STB and TV will be able to provide subscribers with advanced and personalized services by downloading and installing advanced and personalized apps from cable operators' platforms and third-party platforms, which are interconnected with the related cable operators' platforms. Recommendation ITU-T J.1203 is developed in accordance with the requirements defined in Recommendation ITU T J.1201 and based on the architecture defined in Recommendation ITU-T J.1202. This Recommendation provides a specification for administrations and entities who intend to implement a smart TV operating system over integrated broadcast and broadband cable networks.
- **ITU-T J.1204 (revised) "The security framework of a smart TV operating system"** defines the security framework of a smart television operating system (TVOS) to enable integrated broadcast and broadband (IBB)-capable cable set-top box (STB) and TV to apply to broadcasting services and IP-based interactive services provided by cable television operators and third-party providers. By running the smart TV operating system, the IBB capable STB and TV will be able to provide subscribers with advanced and personalized services by downloading and installing advanced and personalized apps from cable operators' platforms and third-party platforms, which are interconnected with the related cable operators' platforms. Recommendation ITU-T J.1204 intends to specify the security framework of a smart TV operating system over integrated broadcast and broadband cable networks, which exploits the popular hardware based trusted execution environment (TEE) technology and has multiple security defence capabilities.
- **ITU-T J.1205 "The HAL API of a smart TV operating system"** defines the hardware abstract layer API of a smart TV operating system (TVOS) to enable integrated broadcast and broadband (IBB)-capable cable set-top box (STB) and TV to apply to broadcasting services and IP-based interactive services provided by cable television operators and third-party providers. The TVOS hardware abstract layer (HAL) consists of multiple hardware abstraction functional interface modules. These modules implement abstraction and encapsulation of different hardware capabilities and provide the upper-layer software with interfaces used to invoke the corresponding hardware capabilities.
- **ITU-T L.209 "Requirements for Fibre Optic Network Terminal Box (FONT)"** describes the requirements of a combined housing for 'Fibre Optic Network Terminal box' (FONT) to keep in a single box active elements like ONT, battery and its charge controller (power

supply) as well as passive elements like fibre patch panel, connectors, splitters and fibre splice trays, instead of having multiple boxes for active and passive elements separately. This recommendation will be especially helpful to service providers for FTTx applications in areas where ownership, space, safe custody and availability of power supply source are hurdles to deployment. The FONT should have two compartments with independent doors. The active elements compartment should have provision for natural ventilation required for active elements in addition to sealing against ingress of dust and liquid which is required for both the compartments. The passive element compartment should have the features of a standard FDB (Fibre Distribution Box).

The FONT comprises of:

- a mechanical structure (box housing) for mechanical and environmental protection of active and passive elements with provisions for thermal management/ventilation of active elements and sealing of internal systems;

- a simple fibre management system for guiding and managing the fibres and fibre connections inside the box;

- a cable attachment and termination system for attaching and terminating cable ends.

Mechanical and environmental characteristics and evaluation of performance should comply with the provisions of [ITU-T L.200/51] for passive element compartment and [ITU-T L.204/70] for active element compartment.

- **ITU-T L.316 "Cable identification for the construction and maintenance of optical fibre cable networks with optical sensing technique"** covers cable identification for the construction and maintenance of optical cable networks. Cable identification is performed to find and/or to trace target cable/route by using optical fibre sensing techniques under deployed conditions characterized by a number of cables.

- **ITU-T L.400/L.12 (revised) "Optical fibre splices"**: Splices are critical points in the optical fibre network, because they strongly affect the quality of the links, as well as their lifetime. In fact the splice should ensure high quality and stability of performance with time. High quality in splicing is usually defined as low splice loss and tensile strength near that of the fibre proof-test level. Splices should be stable over the design life of the optical fibre link under its expected environmental conditions.
  At present two technologies, fusion and mechanical can be used for splicing glass optical fibres and the choice between them depends upon the expected functional performance and considerations of installation and maintenance. These splices are designed to provide permanent connections.

- **ITU-T M.3381 "Requirements for energy saving management of 5G RAN system with AI"** provides requirements for energy saving management of 5G RAN system with artificial intelligence (AI). The goal of the Recommendation is to explain the requirements of using AI technology to achieve energy saving management for communication units and virtualized hardware resources of 5G RAN system, via EMS and open interfaces provided by vendors, from the OSS level. In addition, this Recommendation includes process recommendations for sending intelligent energy saving strategies from OSS to EMS and then to wireless equipment. This Recommendation describes functional requirements for

energy saving management of 5G RAN system with AI, and it also describes use cases of energy saving management of 5G RAN system with AI.

- **ITU-T M.3382 "Requirements for work order processing in telecom management with AI"** provides requirements for work order processing in telecom management with AI. Based on AI models and features extraction, work orders will be collected, analyzed, forwarded and archived. This Recommendation describes the framework and functional requirements for work order processing in telecom management with AI, and requirements of work orders. It also describes the process of text and image feature extraction.
- **ITU-T P.64 (revised) "Determination of sensitivity/frequency characteristics of local telephone systems"** is mainly concerned with the electro-acoustical measurements required for supplying sensitivity/frequency characteristics suitable for use in calculating loudness ratings, or estimating other subjectivity-determined quantities. For this purpose, measurements under real conditions must form the basis. Artificial mouths and artificial ears must be used with due regard to obtaining good agreement between these measurements and those from real mouth and ear determinations. Measurements under real conditions are complicated, time-consuming and not reproducible with great precision. This Recommendation describes measurement methods using recommended forms of artificial mouths and artificial ears (see Recommendations ITU-T P.51 and P.57). This Recommendation applies mainly to local telephone systems (LTSs) with handset telephones; however, the principles also apply to other types of telephones. Annexes D, E and F define handset positions to be used with the head and torso simulator (HATS) according to ITU-T P.58 and P.57 type 3.3, 3.4, 4.3 and 4.4 artificial ears. Allowance is given to placing the handset in a way which best represents its intended use. Annex G describes the correspondence between measurements using the loudness rating guard-ring position (LRGP) and the HATS position.
- **ITU-T P.380 (revised) "Electro-acoustic measurements on headsets"** provides testing methods for headsets using the head and torso simulator. The Recommendation addresses the following topics: selection of artificial ears, classification of headsets, positioning of headsets on HATS, test repeatability and contents of the measurement report.
- **ITU-T P.Imp565 "Implementer's Guide for Recommendation ITU-T P.565"** provides information about the handling of the wide-band modes of voice codecs EVS and Opus at coding rates above 20 kbits/s by Recommendation ITU-T P.565. This document contains all updates submitted up to and including those at Study Group 12 meeting in June 2022. This document was agreed by ITU-T Study Group 12 on 17 June 2022 and is the initial version of this implementer's guide for Recommendation ITU-T P.565.
- **ITU-T P.Imp565.1 "Implementer's Guide for Recommendation ITU-T P.565.1"** provides information about the handling of the wide-band modes of voice codecs EVS and Opus at coding rates above 20 kbits/s by Recommendation ITU-T P.565.1. This document contains all updates submitted up to and including those at Study Group 12 meeting in June 2022. This document was agreed by ITU-T Study Group 12 on 17 June 2022 and is the initial version of this implementer's guide for Recommendation ITU-T P.565.1.

- **ITU-T P.581 (revised) "Use of head and torso simulator for hands-free and handset terminal testing"** covers hands-free (including speakerphone, loudspeaking and headset) and handset terminals and includes clauses for the calibration and use of the head and torso simulator (HATS) for handset and headset terminals. This Recommendation specifies the use of the HATS for speakerphone terminal subjective and objective evaluations (e.g., Recommendation ITU T P.340). It defines the test arrangements, the mouth calibration, the binaural equalization and loudness summation, as well as the method for headphone calibration to be applied for subjective third-party listening tests as described in Recommendation ITU-T P.832.
- **ITU-T P.852 "Subjective quality evaluation of text-based chatbots"** describes methods and procedures for conducting subjective evaluation experiments for services which are based on text-based chatbots. Such chatbots enable a natural language-based dialogic interaction via text, and are used to offer customer care self-services, service selling, or alike. The set-up and running of appropriate interaction experiments is described, and questionnaires for quantifying the relevant quality dimensions perceived by the user are given.
- **ITU-T P.863.2 "Extension of P.863 for multi-dimensional assessment of degradations in telephony speech signals up to full-band"** describes a set of models for predicting perceptual dimensions of degradations linked to the overall speech quality from narrowband (NB) (300 to 3 400 Hz) to full-band (FB) (20 to 20 000 Hz) telecommunication scenarios. The predictions target user judgments on four perceptual dimensions, as obtained in a subjective test described in Annex I to this Recommendation. The models described in this Recommendation are partially based on internal parameters of the model given in ITU-T Rec. P.863. This Recommendation presents a detailed description of all model parts which are not contained in ITU-T Rec. P.863. A conformance testing procedure is also specified in Annex B to allow a user to validate that an alternative implementation of the models is correct.
- **ITU-T P.Imp863 "Implementer's Guide 3 for Recommendation ITU-T P.863"** provides information about the handling of the wide-band modes of voice codecs EVS and Opus at coding rates above 20 kbits/s by Recommendation ITU-T P.863. This document contains all updates submitted up to and including those at Study Group 12 meeting in June 2022 except for those already published in the earlier Implementer's Guides from 05/18 and 12/19. This document was agreed by ITU-T Study Group 12 on 17 June 2022.
- **ITU-T P.910 (revised) "Subjective video quality assessment methods for multimedia applications"** describes non-interactive subjective assessment methods for evaluating the one-way overall video quality for multimedia applications, such as videoconferencing, storage and retrieval applications, as well as telemedical applications. These methods can be used for several different purposes including, but not limited to, selection of algorithms, ranking of audiovisual system performance and evaluation of the quality level during an audiovisual connection. Recommendation ITU-T P.910 also outlines the characteristics, like duration, kind of content and number of sequences, of the source sequences to be used.
- **ITU-T P.1140 (revised) "Speech communication requirements for emergency calls originating from vehicles"** defines use cases, requirements and associated test methods for speech communication for emergency call communications originating from vehicles

using a dedicated emergency call system covering built-in emergency call systems (manufacturer installed) as well as after-market emergency call kits. This Recommendation contains an electronic attachment containing the set of freely-available test signals referred to within the Recommendation.

- **ITU-T P.1204.4 (revised) "Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to full and reduced reference pixel information"** describes the reduced-reference and full-reference video quality estimation model for Recommendation ITU-T P.1204 for monitoring the video quality for streaming using reliable transport (e.g., hypertext transfer protocol- (HTTP-) based adaptive streaming (HAS) over the transmission control protocol (TCP), quick user datagram protocol internet connections (QUIC)). The estimate is validated for videos encoded with H.264, H.265, video payload type 9 (VP9), or AOMedia Video 1 (AV1) codecs at any resolution up to 4K/ultra-high definition (UHD) (3 840 × 2 160) resolution for personal computer (PC) monitors and television (TV) and up to 2 560 × 1 440 for smartphone and tablet displays. The ITU-T P.1204 series of Recommendations provides sequence-related (between 5 s and 10 s) and per-1-second video-quality estimation. In principle, the per-one-second outputs of these video-quality models can be used together with an audio model for integration into audiovisual quality and, together with information about initial loading delay and media playout stalling events, further into a final per-session model output, an estimate of integral per-session quality (see e.g., Recommendations ITU-T P.1203, ITU-T P.1203.2, ITU-T P.1203.3). Recommendation ITU-T P.1204.4 was developed in collaboration with the Video Quality Experts Group (VQEG).
- **ITU-T P.1320 "QoE assessment of extended reality (XR) meetings"** advises on aspects of importance for QoE assessment of telemeetings with extended reality elements. The goal is to define the human, context, and system factors that affect the choice of the QoE assessment procedure and metrics when extended reality telemeeting systems are under evaluation.
- **ITU-T P.1402 "Guidance for the development of machine learning based solutions for QoS/QoE prediction and network performances management in telecommunication scenarios" (under approval)** introduces Machine Learning techniques and their application for QoS/QoE prediction and network performance management in telecommunication scenarios. Especially, the design of training and evaluation data is described and means to avoid overtraining for Machine Learning models. It is also discussed the relation to classical model or algorithm development and differences are described. This recommendation gives best practice guidance for the successful development and evaluation of models based on Machine Learning but does not describe concrete models or algorithms for a dedicated purpose.
- **ITU-T Q.819 "REST-based Management Services"** defines a set of services required to support REST-based interfaces and along with Recommendation ITU-T X.785 composes a framework for REST-based network management interfaces. It specifies protocol requirements, and defines some network management-specific support services, which are notification service, heartbeat service, and containment service. The JSON/YAML interface definitions for the network management-specific support services are also provided.

- **ITU-T Q.4102 "Hybrid peer-to-peer (P2P) communications: Peer protocol"** specifies the peer protocol for communication among peers. The peer protocol enables peers to organize tree-based overlay network of hybrid peer-to-peer overlay network and to distribute data over the overlay network. For overlay network organization, this protocol supports the establishment of connections among peers, maintenance of the connections, data delivery, and data recovery. This Recommendation specifies connection types among peers, resource elements types used in message header, protocol messages exchanged among peers and information flows for describing behaviors of peer.
- **ITU-T Q.4103 "Hybrid peer-to-per (P2P) communications: Overlay management protocol"** specifies a protocol for managing hybrid peer-to-peer overlay network for being used between hybrid peer and hybrid overlay management server. This protocol supports of overlay network management such as creation, query, modification and removal, and peer management such as join, leave, report and refresh. In order to manage the overlay network, it needs to specifies the control data to be conveyed and method to deliver the control message. For this, this Recommendation specifies resource elements for managing hybrid peer-to-peer overlay network and the message syntaxes, and provides protocol operations and information flows.
- **ITU-T X.672 | ISO/IEC 29168-1 (revised) "Information technology – Open systems interconnection – Object identifier resolution system"** specifies the object identifier (OID) resolution system (ORS). This enables (arbitrary) information to be associated with any ORS-supported OID node (of the international object identifier tree defined in Rec. ITU-T X.660 | ISO/IEC 9834-1). This associated information is identified by an application specification that may have a requirement for instances of that application (running on any computer system) to obtain the associated information by an ORS search, using an ASN.1 OID-IRI value to identify the node. Currently defined application information for a node includes the canonical form of an international object identifier, child node information, registration information about the owner of the node, a reference to an ASN.1 module identified by the node, information supporting tag-based applications, and information supporting cybersecurity.

- **ITU-T T.701.21 "Guidance on audio description":** Audio description is a service or feature of the auditory modality that contains an oral narration with details or context involving situations and scenes found in an audiovisual content (such as recorded video presentations, broadcast television, cinema, live or recorded drama). The primary users of audio description are blind persons or persons with low vision and their friends and family. Recommendation ITU-T T.701.21 provides guidance to audio description developers and practitioners in creating effective content describing audiovisual material in an auditory-only modality, the style or manner in which audio description is delivered, the audio description script and script time cues, in relation to the original content. ITU-T T.701.21 is twin with the published ISO/IEC TS 20071-21:2015 "Information Technology – User interface component accessibility – Part 21: Guidance on audio description" developed by ISO/IEC JTC1 SC35.

- **ITU-T T.701.25 "Guidance on the audio presentation of text in videos, including captions, subtitles and other on-screen text":** Audiovisual content (such as video) often contain text, which cannot be easily accessed by a wide section of the audience. While captions/subtitles provide text alternatives to audio elements in audiovisual content, other on-screen text may have various functions. It can be part of the story (as a message

written on a piece of paper by one of the characters) or it can provide additional information (such as graphs, emergency alerts or superimposed titles). Complementarily, audio description provides a description of audiovisual content auditorily, including captions/subtitles and other on-screen text if present and are of particular benefit to persons who, for different reasons, cannot access on-screen text. However, some users may only require captions/subtitles and other on-screen text to be made accessible as audio because they already have access to other visual content such as the images.

This Recommendation provides guidance for audiovisual content producers, distributors and exhibitors on the audio presentation of captions/subtitles and other on-screen text. It acknowledges the relationship with existing access services such as audio description. While considering current implementations, as well as future possibilities suggested by research, and bearing in mind possible trade-offs between quantity and quality, this document positions itself for situations in which various access services coexist and users are given the choice to select those best suited to their needs.

- **ITU-T X.786 "Guidelines for implementation conformance statement proformas associated with REST-based management systems"** provides guidelines for implementation conformance statement (ICS) proformas for REST-based interface systems. It provides an overview and constructions for the OpenAPI Specification (OAS), and provides several proformas (tables) for each OAS syntax component to be used in REST-based interfaces. Instructions on how to complete the columns in the conformance tables are also provided. Examples of REST-based interface ICSs are provided in appendices.
- **ITU-T Y.1545.2 "QoS metrics for continuity-of-performance of packet data based services"** defines spatially resolved metrics for packet-data based services and a methodology for their computation, using the same conceptual framework as Recommendation ITU-T G.1034. The metrics are covering the QoS and QoE aspects of a wide range of applications used in motion, i.e. during travel. A taxonomy of application categories is provided, taking into account their absolute data rate requirements and, in particular, their sensitivity against temporary drops in available data rates which are caused by motion through an environment which is characterized by spatial variation of network performance, i.e. available data rate or latency. The methodology defines a way to create a description of such spatial distributions of performance, termed route profiles, and a way to use route profiles to create predictions of QoS and QoE of application usage. It also defines a new entity to describe local network performance which provides an abstraction and thereby a versatile way to express performance requirements.
- **ITU-T Y.2344 "Scenarios and requirements of Intent-Based Network for network evolution" (under approval)** aims to provide the scenarios and requirements of Intent-Based Network for network evolution. The scope of this Recommendation includes:
  - Scenarios and workflow of Intent-Based Network for network evolution.
  - Capability requirements of Intent-Based Network for network evolution.
  - General framework of Intent-Based Network for network evolution.
- **ITU-T Y.3079 "Information-Centric Networking in networks beyond IMT-2020: Framework of locally enhanced name mapping and resolution" (under approval)** specifies the framework of locally enhanced name mapping and resolution to achieve high

performance of deterministic latency and scalability for a massive number of named objects for information centric networking (ICN)in networks beyond IMT-2020.

- **ITU-T Y.3080 "Information-Centric Networking in networks beyond IMT-2020: Requirements and Mechanisms of Transport Layer" (under approval)** describes the requirements and mechanisms of transport layer for information-centric networking (ICN) in networks beyond IMT-2020. (1) It provides an introduction to transport layer in networks beyond IMT-2020. (2) It describes service and functional requirements of transport layer. (3) Based on the requirements, it specifies the mechanisms of transport layer for information-centric networking (ICN) in networks beyond IMT-2020.
- **ITU-T Y.3081 "Self-Controlled Identity based on Blockchain: Requirements and Framework" (under approval)** presents the motivations and principles for self-controlled identity based on blockchain in future networks including networks beyond IMT-2020. It provides the high-level framework and requirements of self-controlled identity based on blockchain. It specifies the capability requirements of the self-controlled identity based on blockchain accordingly in the context of future networks including networks beyond IMT-2020. Detailed descriptions of the use cases and business models are listed in the appendix.
- **ITU-T Y.3090 "Digital twin network - Requirements and architecture"**: Digital twin network (DTN) is a virtual representation of a physical network. It is useful for analysing, diagnosing, emulating and controlling the physical network based on data, model and interface, so as to achieve the real-time interactive mapping between the physical network and the digital twin network. This Recommendation describes the requirements and architecture of DTN.
- **ITU-T Y.3117 "Quality of service assurance-related requirements and framework for smart education supported by IMT-2020 and beyond" (under approval)** specifies the quality of service (QoS) assurance-related requirements and framework for smart education supported by the international mobile telecommunications 2020 (IMT-2020) and beyond. Recommendation ITU-T Y.3117 (Y.IMT2020-qos-req-se) first provides an overview of smart education supported by IMT2020 and beyond. It then specifies the QoS assurance-related requirements and a framework. Finally, the QoS consideration for smart education services are described in Appendix I.
- **ITU-T Y.3118 "Requirements and framework for jitter guarantee in large scale networks including IMT-2020 and beyond" (under approval)** specifies the requirements and framework for an effective and efficient solution of jitter guarantee for dynamic traffic with arbitrary input patterns in large-scale networks including IMT-2020 and beyond. The framework in this Recommendation is composed of the time-stamping and the buffering functions at the network boundary. It is scalable and does not rely on time synchronization or slot scheduling.
- **ITU-T Y.3137 "Technical requirements for supporting application addressing in edge computing for future networks including IMT-2020" (under approval)**: Application addressing is the process to discover the IP address of the server which the application running on when UE intends to access the application. This Recommendation specifies the technical requirements for supporting application addressing in edge computing for

future networks including IMT-2020, and also proposes new requirements towards fixed mobile convergence (FMC) architecture for future networks including IMT-2020.

- **ITU-T Y.3180 "Mechanism of traffic awareness for application-descriptor-agnostic traffic based on machine learning"** specifies the mechanism of traffic awareness for application-descriptor-agnostic traffic based on machine learning. This Recommendation specifies the following aspects related to traffic awareness for application-descriptor-agnostic traffic: overview, general mechanism, used machine learning methods, implementation consideration based on machine learning, report and auxiliary control mechanism for the malicious application-descriptor-agnostic traffic and security consideration.
- **ITU-T Y.3654 "Big data driven networking - Machine learning mechanism"** specifies the mechanisms of machine learning in big data driven networking (bDDN). A set of related aspects of machine learning in bDDN are presented, these aspects include: overview, learning procedure, deployment, interfaces, learning path and control path, security consideration.
- **ITU-T Y.3680 "Framework of human-like networking"**: Artificial intelligence technologies, network awareness technologies, network self-restructuring technologies and other technologies applied into network area can bring about innovation of network and new network architecture. Introducing human-like features into network can make the network make full use of advantages of human being and bring a new network architecture named human-like networking to birth. This Recommendation specifies framework for human-like networking. This Recommendation specifies following aspects of human-like networking: overview of human-like networking, framework of human-like networking, generic architecture model for human-like networking based on function and capability, relationship between layers, sub-network and networks for human-like networking, interface aspect of human-like networking and security consideration.
- **ITU-T Y.Suppl.71 to ITU-T Y.3000-series "Use cases for Autonomous Networks"** discusses use cases for autonomous networks. The use cases are divided into two categories, and possible requirements, interactions among actors and possible key components are also discussed. Various use cases are derived according to the key concepts behind autonomous networks of exploratory evolution, real-time responsive experimentation and dynamic adaptation to enable handling of hitherto unseen changes in network scenarios or inputs to reduce the human effort involved in managing the network.
- **ITU-T Z.161 (revised) "Testing and Test Control Notation version 3: TTCN-3 core language"** (under approval) defines Testing and Test Control Notation 3 (TTCN-3) intended for specification of test suites that are independent of platforms, test methods, protocol layers and protocols. TTCN-3 can be used for specification of all types of reactive system tests over a variety of communication ports. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of Common Object Request Broker Architecture (CORBA) based platforms and application programming interfaces (APIs). The specification of test suites for physical layer protocols is outside the scope of this Recommendation. This revision of the Recommendation contains amendments, clarifications, corrigenda and editorial corrections.
- **ITU-T Z.161.1 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Support of interfaces with continuous signals"** (under approval) defines the

"continuous signal support" package of TTCN 3. TTCN 3 can be used for the specification of all types of reactive system tests over a variety of communication ports. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of Common Object Request Broker Architecture (CORBA) based platforms, testing of application programming interfaces (APIs), etc. TTCN 3 is not restricted to conformance testing and can be used for many other kinds of testing including interoperability, robustness, regression, system and integration testing. The specification of test suites for physical layer protocols is outside the scope of this Recommendation.

- **ITU-T Z.161.2 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Configuration and deployment support"** (under approval) defines the configuration and deployment support package of TTCN-3. TTCN-3 can be used for the specification of all types of reactive system tests over a variety of communication ports. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of Common Object Request Broker Architecture (CORBA) based platforms, application programming interfaces (APIs), etc. TTCN-3 is not restricted to conformance testing and can be used for many other kinds of testing including interoperability, robustness, regression, system and integration testing. The specification of test suites for physical layer protocols is outside the scope of this Recommendation.
- **ITU-T Z.161.3 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Advanced parameterization"** (under approval) defines the advanced parameterization package of TTCN-3. TTCN 3 can be used for the specification of all types of reactive system tests over a variety of communication ports. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of Common Object Request Broker Architecture (CORBA) based platforms, application programming interfaces (APIs), etc. TTCN-3 is not restricted to conformance testing and can be used for many other kinds of testing including interoperability, robustness, regression, system and integration testing. The specification of test suites for physical layer protocols is outside the scope of this Recommendation.
- **ITU-T Z.161.4 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Behaviour types"** (under approval) defines the behaviour types package of TTCN 3. TTCN 3 can be used for the specification of all types of reactive system tests over a variety of communication ports. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of Common Object Request Broker Architecture (CORBA) based platforms, application programming interfaces (APIs), etc. TTCN 3 is not restricted to conformance testing and can be used for many other kinds of testing including interoperability, robustness, regression, system and integration testing. The specification of test suites for physical layer protocols is outside the scope of this Recommendation.
- **ITU-T Z.161.5 (revised) "Testing and Test Control Notation version 3: TTCN-3 Language extensions: Performance and real time testing"** (under approval) defines the real-time and performance testing support package of TTCN-3. TTCN-3 can be used for the specification of all types of reactive system tests over a variety of communication ports. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of OMG CORBA

based platforms, APIs, etc. TTCN-3 is not restricted to conformance testing and can be used for many other kinds of testing including interoperability, robustness, regression, system and integration testing. The specification of test suites for physical layer protocols is outside the scope of this Recommendation.

- **ITU-T Z.161.6 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Advanced matching"** (under approval) defines the support of advance matching of TTCN-3. TTCN-3 can be used for the specification of all types of reactive system tests over a variety of communication ports. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of OMG CORBA based platforms, APIs, etc. TTCN-3 is not restricted to conformance testing and can be used for many other kinds of testing including interoperability, robustness, regression, system and integration testing. The specification of test suites for physical layer protocols is outside the scope of the present document.
- **ITU-T Z.161.7 (revised) "Testing and Test Control Notation version 3: TTCN-3 Language Extensions: Object-Oriented Features"** (under approval) defines the support for object-oriented features in TTCN-3. TTCN-3 can be used for the specification of all types of reactive system tests over a variety of communication ports. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of OMG CORBA based platforms, APIs, etc. TTCN-3 is not restricted to conformance testing and can be used for many other kinds of testing including interoperability, robustness, regression, system and integration testing. The specification of test suites for physical layer protocols is outside the scope of the present document.
- **ITU-T Z.165 (revised) "Testing and Test Control Notation version 3: TTCN-3 runtime interface (TRI)"** (under approval) provides the specification of the runtime interface for TTCN-3 (Testing and Test Control Notation 3) test system implementations. The TTCN-3 Runtime Interface (TRI) provides the recommended adaptation for timing and communication of a test system to a particular processing platform and the system under test, respectively. This Recommendation defines the interface as a set of operations independent of target language.
- **ITU-T Z.165.1 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Extended TRI"** (under approval) defines the extended TRI package of TTCN 3. TTCN 3 can be used for the specification of all types of reactive system tests over a variety of communication ports. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of CORBA based platforms, APIs, etc. TTCN 3 is not restricted to conformance testing and can be used for many other kinds of testing including interoperability, robustness, regression, system and integration testing. The specification of test suites for physical layer protocols is outside the scope of this Recommendation.
- **ITU-T Z.166 (revised) "Testing and Test Control Notation version 3: TTCN-3 control interface (TCI)"** (under approval) specifies the control interfaces for Testing and Test Control Notation 3 (TTCN-3) test system implementations. The TTCN-3 control interfaces (TCIs) provide a standardized adaptation for management, test component handling and encoding/decoding of a test system to a particular test platform. This Recommendation defines the interfaces as a set of operations independent of a target language. The interfaces are defined to be compatible with the TTCN-3 standards (see clause 2 of ETSI

ES 201 873-6 V4.12.1). The interface definition uses the Common Object Request Broker Architecture (CORBA) Interface Definition Language (IDL) to specify the TCI completely. Clauses 8, 9 and 9.7 of ETSI ES 201 873-6 V4.12.1 present language mappings for this abstract specification to the target languages Java and ANSI C. This revision of the Recommendation contains amendments, clarifications, corrigenda and editorial corrections.

- **ITU-T Z.167 (revised) "Testing and Test Control Notation version 3: Using ASN.1 with TTCN-3"** (under approval) defines a normative way of using ASN.1 as defined in Recommendations ITU-T X.680, ITU-T X.681, ITU-T X.682 and ITU-T X.683 with TTCN-3. The harmonization of other languages with TTCN-3 is not covered by this Recommendation. This revision of the Recommendation contains amendments, clarifications, corrigenda and editorial corrections.

- **ITU-T Technical Report ESTR-KPI-RAN "Key performance indicators (KPIs) for radio access mobile networks"** presents a framework that stakeholders can use as benchmarking when defining key performance indicators (KPIs) for radio access mobile networks.

75. The Financial Inclusion Global Initiative (FIGI) is a three-year programme of collective action led by ITU, the World Bank Group and the Committee on Payments and Market Infrastructures, with support from the Bill & Melinda Gates Foundation. FIGI is designed to advance research in digital finance and accelerate digital financial inclusion in developing countries. ITU leads the FIGI Security, Infrastructure and Trust Working Group as well as the organization of FIGI symposia. The third FIGI Symposium 2021 was held online over six weeks from 18 May to 24 June 2021. H.M Queen Maxima of Netherlands and UN Secretary General's Special Advocate for Inclusive Finance and Development made a keynote address at the opening of the event. The recordings of the sessions of the Symposium can be accessed online here. The event saw participation of some 1,782 live participants from 148 countries over the six weeks period and the recordings were accessed by some 5,870 persons worldwide.

76. FIGI has worked to raise awareness about SS7's security vulnerabilities and associated mitigation techniques. As the need to mitigate these vulnerabilities increases, network operators can look to ITU's new Q.3057 standard outlining signalling requirements and architecture for interconnection between trustable network entities.

    Under ITU led work in the FIGI Security, Infrastructure and Trust working group, the following activities were undertaken in 2021:

    - The use of the guidance note on 'Methodology for measurement of Quality of Service (QoS) Key Performance Indicators (KPIs) for Digital Financial Services' as an international standard by ITU in December 2019.
    - The Methodology for QoS/QoE measurement for interoperability and cross border payment report will be further discussed in ITU-T Study Group 12 in 2021 to be integrated in a new ITU-T Recommendation.
    - A new Question (Q13) was created in Study Group 12 on Perceptual and field assessment principles for quality of service (QoS) and quality of experience (QoE) of digital financial services (DFS) – all DFS QoS recommendations including the interoperability and cross border QoS testing will be standardized in this Question.

- ITU set up a DFS Security Lab under FIGI work to conduct security audit of DFS mobile applications used in developing and Least Developed countries. The security lab has conducted security audit of mobile payment applications used in Zambia and is working with developing economies in Africa and Asia to implement the security recommendations from FIGI and conduct security audit of mobile payment applications used in those countries.
- The following reports were published in 2021:
    - eKYC use cases in DFS;
    - DFS Competency Framework;
    - DFS Security audit guideline;
    - Security audit of Android based DFS applications which describes a methodology for analysis security of Android DFS apps based on OWASP Mobile Top 10 Security Risks

➢ The new Digital Currency Global Initiative is a collaboration between ITU and Stanford University that was established in July 2020. The Initiative is an open platform for dialogue and research on pilot implementations of digital currency, their use cases, applications and developing specifications for technical standards that will foster adoption, universal access, and ultimately financial inclusion. Its various working groups and work streams held some 11 virtual meetings in the period January to September 2021.

77. The United for Smart Sustainable Cities (U4SSC) initiative, supported by 17 UN bodies, advocates for public policy to ensure that ICTs – and ICT standards in particular – play a definitive role in the transition to smart cities.

    More than 150 cities worldwide are evaluating their progress towards the SDGs with "Key Performance Indicators for Smart Sustainable Cities" based on ITU standards, indicators promoted by U4SSC. New U4SSC reports include "Smart public health emergency management and ICT implementations", "Compendium of survey results on integrated digital solutions for city platforms around the world" and "Digital solutions for integrated city management and use cases", as well as a range of city snapshots, factsheets and verification reports sharing the results of the latest KPI evaluations.

    The first United for Smart Sustainable Cities (U4SSC) Austrian U4SSC Country Hub will be hosted by the Austrian Economics Center in Vienna, Austria. The main objective of this country hub is to promote the work of U4SSC.

    U4SSC is working on the following Thematic Groups:

    - City Platforms;
    - Economic recovery in cities and urban resilience building in the time of COVID-19;
    - Innovative Financing Instruments for Smart Sustainable Cities;
    - Guiding principles for artificial intelligence in cities;
    - Procurement Guidelines for Smart Sustainable Cities; and
    - Enabling People-Centred Cities through Digital Transformation.

78. The AI for Road Safety initiative was launched on 6 October 2021 by ITU together with UN Secretary-General's Special Envoy for Road Safety and the UN Envoy on Technology. Since its establishment the AI for Road Safety initiative has been functioning in line with the UN General Assembly Resolution on Improving global Road Safety, and the UN Secretary General's roadmap on digital cooperation. The activities of this initiative are oriented towards the United Nations Sustainable Development Goals, especially Target 3.6 to halve by 2030 the number of global deaths and injuries from road traffic accidents, and the SDG Goal 11.2 to provide access to safe, affordable, accessible and sustainable transport systems for all by 2030. In accordance with its scope, this initiative will continue to organize Webinars, challenges and explore the AI for Road Safety readiness landscape.

79. The ITU/WMO/UNESCO-IOC Joint Task Force on SMART[2] Cable Systems is leading an ambitious project to equip submarine communications cables with climate and hazard-monitoring sensors to create a global observation network capable of providing earthquake and tsunami warnings as well as data on ocean climate change and circulation.

The information from SMART cables can be used for:

- Climate change monitoring including ocean circulation, heat content and sea level rise;
- Tsunami and earthquake early warning for disaster risk reduction;
- Seismic monitoring for earth structure and related hazards;
- Quantifying risk to inform sustainable development of coastal and offshore infrastructure, and
- Warning of external hazards to cables, and improved routing of cable systems

Several recent events have contributed to positive developments:

- The Italian National Institute of Geophysics and Volcanology (INGV) has undertaken a technical "wet demo" project off Sicily, jointly funded by the government and the European Commission. This project is ongoing.
- The Portuguese Government, with guidance from its telecom regulatory agency ANACOM, directed that the new CAM ring (Continent-Azores-Madeira) "… enhance the use of submarine cables such as seismic detection, environmental monitoring Oceanography, Geophysics and Environment …." This culminated in the announcement in September 2020 describing the scope, implementation and funding for deployment, implementation and operation. Recent public conferences indicate this project is well underway for installation in 2024.
- ITU-T Study Group 15 (SG15) created a new work item on SMART cables under Question 8/15 (Characteristics of optical fibre submarine cable systems) at an SG15 meeting in April 2021. This work is ongoing within SG15. It was also discussed at WTSA-20 and WTDC in June 2022. The SMART cables is mentioned in updated WTDC Resolutions 34 and 66.
- At the UN Oceans Conference, Lisbon 27 June – 1 July, Portugal hosted a side event: SMART Subsea Cables Observing the Global Ocean for Climate Monitoring and Disaster Risk Reduction, part of the larger event One Sustainable Ocean, organized by Fórum

[2] Science Monitoring and Reliable Telecommunications

Oceano and ANACOM. The chairman of the JTF on SMART cables, Prof. Bruce How participated as a panelist.

80. ITU is carrying out various activities to encourage and facilitate the participation of academia in the work of the Sector, as well as to benefit from their technical and intellectual expertise.

❖ ITU Journal

The ITU Journal on Future and Evolving Technologies (ITU J-FET), launched in September 2020, is an international journal providing complete coverage of all communications and networking paradigms, free of charge for both readers and authors. Free, fast and for all, this publication addresses fundamental and applied research sharing new techniques, concepts, analyses, and tutorials while discussing implications of the latest research on policy, regulations, legal frameworks and the economy and society. The ITU Journal welcomes submissions at any time, on any topic within its scope and publishes papers continuously throughout the year. Since its establishment, the ITU J-FET has published 3 regular issues and 6 special issues. This year, the Journal has launched 10 new special issues that are currently under preparation:

- 2nd edition of the AI and machine learning solutions in 5G and future networks
- Emerging trends and applications in future communication networks
- Digital continuum and next generation networks
- Future of networking beyond 2030
- Integrated and autonomous network management and control for 6G time-critical applications
- Innovative network solutions for future services
- Intelligent surfaces and their applications towards wide-scale deployment
- Network virtualization, slicing, orchestration, fog and edge platforms for 5G and 6G wireless systems
- AI-driven security in 5G and beyond
- AI for accessibility

Published papers are available to download free of charge from the ITU Digital library.

The joint publication between ITU and Tsinghua University Press, *Intelligent and Converged Networks (ICN)* published 8 issues since its establishment in June 2020. All publications are available for free download on the IEEE *Xplore* Digital Library.

❖ ITU Kaleidoscope Academic conference

The ITU Kaleidoscope series of peer-reviewed academic conferences – technically co-sponsored by the IEEE and IEEE Communications Society (IEEE ComSoc) – calls for original research on ICT innovation and related demands on international standardization.

The 13th edition of the conference, on the theme of Connecting physical and virtual worlds, was held as a fully online conference from 6 to 10 December 2021. Kaleidoscope 2021 original academic papers shared insight into ongoing projects and research relevant to the development of persistent virtual realities and customized computer-generated environments, as well as new possibilities and associated challenges appearing on the horizon. The Conference Proceedings are available to download from the ITU website.

The next edition is under preparation and will be held at the Ghana-India Kofi Annan Centre of Excellence in ICT, Accra, Ghana. ITU Kaleidoscope 2022, Extended reality – How to boost quality of experience and interoperability, will be held from 7 to 9 December 2022. Accepted and presented papers will be published in the Conference Proceedings and will be submitted for inclusion in the IEEE *Xplore* Digital Library. The best papers will be also evaluated for potential publication in the IEEE Communications Standards Magazine.

81. Resolution 177 on Conformance and Interoperability (Dubai, 2018) endorsed the objectives of both Resolution 76 (Rev. Geneva, 2020) and Resolution 47 (Rev. Kigali, 2022) on conformity and interoperability of ICT equipment. The goal of Resolution 76 (Rev. Geneva, 2020) on Conformance and Interoperability testing is to help in increasing probability of interoperability and to ensure all the countries to benefit of ICTs. WTDC-22 reviewed Resolution 47 on enhancement of knowledge and effective application of ITU Recommendations in developing countries, including Conformance and Interoperability (C&I) testing of systems manufactured on the basis of ITU Recommendations. C&I issues are in the Dubai Declaration and are part of Regional Initiatives for AFR and ARB. SG11 developed several new testing specifications, including:

- **ITU-T Q.5024 "Protocol for providing intelligent analysis services in IMT-2020 network"** specifies architecture for supporting intelligent analysis services in IMT-2020 network, and intelligent analysis services offered by Data Analysis Function (DAF) including load balancing, network functions fault location and advance warning, device on/off analysis, mobility analysis, etc. It includes signalling flows for network functions (NFs) event exposure to DAF and DAF analytics exposure to NFs, message format, and security considerations.

ITU-T CASC (Conformity Assessment Steering Committee) was established by ITU-T SG11 in 2015 to elaborate the recognition procedure of Testing Laboratories (TLs) which have competence for testing against ITU-T Recommendations. CASC developed ITU-T Guideline "Testing Laboratories Recognition Procedure" (2015), which was further revised in July 2022.

In 2017 and further in 2019, SG11 agreed a Guideline "ITU-T CASC procedure to appoint ITU-T technical experts". Those experts could be included in the assessment team of ILAC in order to evaluate TL which have competence on particular ITU-T Recommendations. In 2019, SG11 appointed several ITU technical experts on different ITU-T Recommendations.

ITU-T CASC is collaborating with ILAC on TL recognition procedure. In March 2021, SG11 decided that ITU recognizes the Testing Laboratories (TLs) which are accredited by an Accreditation Body that is a signatory to the ILAC MRA for testing, which scope of accreditation contains ITU-T Recommendation(s). The TL recognition procedure was announced in January 2022 (TSB Circular 368).

The C&I Portal is responsible to gather all information about the work done in Pillars 1 (conformance assessment) and 2 (interoperability); as Pillars 3 (capacity building) and 4 (assistance in the establishment of test centres and C&I programmes in developing countries).

The following ITU guidelines have been published on C&I: *i)* Guidelines for the development, implementation and management of mutual recognition arrangements/agreements (MRAs) on conformity assessment; *ii)* a Feasibility Study for the establishment of a ConformanceTesting Center; *iii)* Guidelines on Establishing Conformity and Interoperability Regimes – Basic and Complete Guidelines.; *iv)* Guidelines for Developing Countries on establishing conformity assessment test labs in different regionsITU has organized C&I training events and workshops in the regions. During these events, key issues were discussed highlighting the relevance of accreditation and certification, including mutual recognition agreements and arrangements to increase confidence in conformity assessment and decreasing the need of repeated testing. Trainings on EMC, mobile terminals, and C&I regimes for experts from Americas, Africa, Arab, CIS, and Asia-Pacific regions has been organized in the premises of partners' laboratories in the regions. Guidelines for building Test Labs for C&I of equipment and systems in developing countries were distributed, during the forums and the training courses.

ITU is preparing assessment studies in the regions to determine C&I areas of commonalities and differences in the concerned countries, allowing to assessing the present situation in each beneficiary country and proposing a common C&I regimes for the participant countries. While promoting regional integration on ICT, the result of the studies can include either building new labs and/or establishing MRAs, as appropriate. Until 2016, assessment studies on C&I for SADC, Maghreb, EAC, COMTELCA the Caribbean Regions were finalized. Follow-up for each of the regions are taking place.

The ITU is providing assistance to developing countries on conformity and interoperability tailored to their needs. The ITU assisted Sri-Lanka, Zambia, Tanzania, Paraguay, and Ghana in building national Human capacity for C&I and to Government of Mongolia in setting up Type Approval systems in the country.

The "ICT product conformity database" provides industry with a means to publicize the conformance of ICT products and services with ITU-T's international standards. Currently, the C&I database contains more than 500 entries which include e-health devices, mobile phones, Ethernet services, IPTV and Mobile Number Portability systems (MNP).

82. ITU has developed an 'EMF Guide mobile app' providing an up-to-date reference of the EMF information provided by the World Health Organization and ITU. The 'EMF Guide mobile app' is available in 6 languages. In April 2016, the EMF Guide & Mobile App on EMF was translated

into Malay. It was launched during the Symposium on ICT, Environment and Climate Change by Dato'Jailani Johari, Deputy Minister of Communication & Multimedia, Malaysia.

83. ITU and its partners, sharing a common community of interest, have recognized the relationship between IMT — International Mobile Telecommunication system — and "5G" and are working towards realizing the future vision of mobile broadband communications. Development of the radio-interface specifications for IMT-2020 has proceeded on schedule towards the timely delivery of the fifth generation (5G) of mobile broadband services. Specifications for UHDTV television with High Dynamic Range (HDR) were also approved in 2017.

84. ITU-R hosted its major events, RA-19 and WRC-19. These were well attended and forged pathways in key areas such as mobile and fixed broadband communications, radiocommunications for transportation systems, satellite services as well as global identifications for International Mobile Telecommunications (IMT).

85. Additional details of the ITU-R objectives (Objective R.1, Objective R.2, Objective R.3) are available online on ITU website.

86. In response to Resolution ITU-R 61-2 "ITU-R's contribution in implementing the outcomes of the World Summit on the Information Society and the 2030 Agenda for Sustainable Development", the Radiocommunication Bureau continues to work on WSIS implementation and follow-up activities within its mandate as well as in achieving the Sustainable Development Goals (SDGs). The document lists of the ITU-R publications related to the SDGs are available here: https://www.itu.int/en/ITU-R/study-groups/Pages/Sustainable-dev-goals.aspx

Action Line C5: Building Confidence and Security in the use of ICTs

Related to SDGs: SDG 1 (1.4), SDG 4 (4.1, 4.3, 4.5), SDGs 5 (5.b), SDGs 7 (7.1, 7.a, 7.b), SDG 8 (8.1), SDGs 9 (9.1, 9.c), 11.3, 11.b, 16.2, 17.8

87. A fundamental role of the ITU, following the WSIS Summit and the 2006 ITU Plenipotentiary Conference is to build confidence and security in the use of ICTs.

88. The 17th Action Line C5 Facilitator's Meeting was held on Monday, 30 May 2022, 16:30-18:15 CEST. The theme of this year was **"Privacy-Preserving Techniques".** The session featured a diverse panel of experts in data and indices relevant to the discussion of cybersecurity. More details about the meeting are available here.

89. The WSIS Prizes 2022 Winner for the Action Line C5 is **Cyber Safety program**, Qatar. Details of the project are available here.

90. **Cybersecurity and Countering Spam Activities**

- The Global Cybersecurity Agenda (GCA) provides a framework for international cooperation aimed at enhancing confidence and security in the information society.

Resolution 130 (Rev. Dubai, 2018) clearly endorses the GCA as the ITU-wide strategy on cybersecurity.

- The GCA is built upon five strategic pillars or work areas around which its work is organized: (i) Legal Measures, (ii) Technical and Procedural Measures, (iii) Organizational Structures, (iv) Capacity Building and (v) International Cooperation. Within ITU, the activities below, organized along the five pillars of the GCA, shows the complementary nature of existing ITU work programmes and facilitates the implementation of BDT, TSB and BR activities in this domain.

(i) Legal Measures (SDG 7 (7.1, 7.a, 7.b), SDG 9 (9.1, 9.c), SDG 11 (11.3, 11.b), SDG 16 (16.2), SDG 17 (17.8))

91. As part of Objective 2/Output 2.2 of the Buenos Aires Action Plan, and taking into account ITU-D Q 3/2 (former Q22/1), ITU is assisting Member States in understanding the legal aspects of cybersecurity through its ITU Cybercrime Legislation Resources in order to help harmonize their legal frameworks. In the area of legal measures, ITU collaborates closely with partners such as UNODC and others.

(ii) Technical and Procedural Measures (SDG 1 (1.4), SDG 7 (7.1, 7.a, 7.b), SDG 9 (9.1, 9.c), SDG 11 (11.3, 11.b), SDG 17 (17.8))

92. In order to identify cyberthreats and countermeasures to mitigate risks, ITU-T has developed Recommendations of security requirements, guidelines and specifications for ICT and IP-based systems. ITU-T also provides an international platform for the development of the protocols, systems and services that protect current and future networks. ITU-T's work on secure communication services, reviews enhancements to security specifications for mobile end-to-end data communications and considers security requirements for web services and application protocols.

93. ITU-T Study Group 17 (SG17) is responsible for building confidence and security in the use of information and communication technologies ICTs. Providing security by ICTs and ensuring security for ICTs are both major study areas for Study Group 17. This includes studies relating to cybersecurity, managed security services, endpoint detection and response, security management, countering spam and identity management. It also includes security architecture and framework, quantum-based security, distributed ledger technology (DLT) security, intelligent transport system (ITS) security, security aspects related to artificial intelligence (AI), and security of networks, applications and services such as Internet of things (IoT) and smart cities, various kinds of networks including IMT-2020/5G and beyond, smart grid, industrial control systems (ICS), supply chain, smartphone, software-defined networking (SDN), network function virtualization (NFV), Internet Protocol television (IPTV), web services, over-the-top (OTT), social network, cloud computing, big data analytics, digital financial system (DFS) and telebiometrics. Building confidence and security in the use of ICTs also includes protecting personally identifiable information (PII), such as technical and operational aspects of data protection with respect to ensuring confidentiality, integrity and availability of PII. Study Group 17 is also responsible for the application of open system communications, including directory and object identifiers, and for technical languages, the method for their usage and other issues related to the software aspects of telecommunication systems, and for test specification languages in support of conformance testing to improve the quality of Recommendations.

SG17 held two meetings in May and August/September 2022 where SG17 established 24 new standardization work items. SG17 approved 40+ new or revised Recommendations on ICT security.

94. ITU-T Recommendations and other texts on security and trust:

- **ITU-T H.235.10 "H.323 security: Support of DTLS for media streams"** describes the security procedures for the establishment of media streams utilising Datagram Transport Layer Security (DTLS). DTLS is becoming more widely used for securing media streams, for example in WebRTC systems.
- **ITU-T Q.3062 "Signalling procedures and protocols for enabling interconnection between trustable network entities in support of existing and emerging networks" (under approval)**: Signaling System No. 7 (SS7) is a stack of signaling protocols, which was initially developed by ITU (CCITT) in the 1980s. Since then, SS7 standards has become a generic stack which are widely applied in public switched telephone network (PSTN) all over the globe. With the growth of mobile telecommunications and appearance of the MAP and CAP protocols, SS7 stack has become suitable for public land mobile network (PLMN), e.g., 2G, 3G networks. Later, SS7 migrated to SIGTRAN stack developed by IETF which allows operators to setup interconnection of SS7-based networks over IP networks. Furthermore, the SS7 logic migrated to DIAMETER which is currently widely used for interconnection of IMS-based networks, including 4G (VoLTE/ViLTE).

  At the **development** stage, SS7 was designed to be managed by operators with the understanding that anyone connected to SS7 network was considered trustworthy. With the current network environment, including interconnection over the Internet, SS7-based networks have become vulnerable and can be easily attacked. Moreover, the latest move to Diameter protocol has not solved any of the basic vulnerabilities found in SS7.

  Presently, there have been multiple cases where SS7 vulnerabilities have been used for different hackers' attacks. Amongst well-known attacks on SS7 networks include telephone spam, spoofing numbers, location tracking, subscriber fraud, intercept calls and messages, DoS, infiltration attacks, routing attacks, etc.

  The goal of this Recommendation is to define the signalling requirements for authentication of signalling messages, in order for operators to be able to verify the authenticity of signalling exchange based on an accepted trust anchor. This Recommendation includes codes and signalling procedures based on ITU-T Q.3057.
- **Recommendation ITU-T Q.3063 "Signalling procedures of calling line identification authentication" (under approval):** SS7 was originally designed for operator management on the assumption that anyone connected to the SS7 network was trustable. In the current network environment, however, there appear more and more untrusted devices (including the PABX, call centre and VoIP access system) that interconnect to PLMN/PSTN. As a result, calling line identification spoofing is particularly effective at defeating call blockers, thus leading to a variety of scams by avoiding identification. The goal of this document is to identify the signalling requirements of calling line identification authentication including codes and signalling procedure base on the mechanism defined in the ITU-T Q.3057.

- **ITU-T X.1234 (revised) "Guidelines for countering multimedia messaging service spam"** specifies guidelines for countering MMS spam. It analyses typical scenarios, characteristics, and recognition methods of MMS spam, and provides a technical framework, work flows and some key technologies of MMS spam recognition, to help MMS providers and MMS users to counter spam.
- **ITU-T X.1235 "Technologies in countering website spoofing for telecommunication organizations"**: Website spoofing is a major threat for telecommunication organizations, especially operators. It is recommended for telecommunication operators to adopt counter website spoofing technologies to protect their customers and guard their reputation and revenue. This Recommendation analyses the main measures to spoof a website and recommends technologies to identify spoofed websites, which can be regarded as guidelines for protecting websites from being spoofed for telecommunication organizations. Similar approach may be implemented against spoofing of any web-site, including banks, insurance companies, internet shops, etc.
- **ITU-T X.1246 Amd.1 "Technologies involved in countering voice spam in telecommunication organizations – Annex A: Interactive and technical measures to combat spam calls"** introduces the feedback mechanism from the client, receiving possible spam call (with voice, SMS, or MMS) to its operator. It provides technical requirements for telecommunication management systems and/or client support services to receive notifications of income spam calls, voice or messages (SMS/MMS). Scenarios of interactive interaction of clients with operators/service providers of telephone communication networks about incoming spam calls and the necessary technical measures to maintain such interaction are presented. Such interaction is based on making a call to the anti-spam number provided by the telecom operator in advance by the recipient of the spam call immediately after it is completed.
- **ITU-T X.1247 Amd.1 "Technical framework for countering mobile messaging spam – Annex A: Interactive and technical measures to combat spam calls"** introduces the feedback mechanism from the client, receiving possible spam call (with voice, SMS, or MMS) to its operator. It provides technical requirements for telecommunication management systems and/or client support services to receive notifications of income spam calls, voice or messages (SMS/MMS). Scenarios of interactive interaction of clients with operators/service providers of telephone communication networks about incoming spam calls and the necessary technical measures to maintain such interaction are presented. Such interaction is based on making a call to the anti-spam number provided by the telecom operator in advance by the recipient of the spam call immediately after it is completed.
- **ITU-T X.1333 "Security guidelines for use of remote access tools in Internet-connected control systems"**: Remote access tools (RATs) are widely used on control systems for monitoring, control and maintenance to reduce maintenance costs and minimize the response time in the event of a malfunction. RATs provide the ability to manipulate control systems remotely, but at the same time, an insecure configuration of RATs and vulnerabilities in RATs could significantly increase the attack surface of control systems. The most serious problem is an interface to access a control system from the external networks that could make attackers access to control system from the Internet. The Recommendation describes a whole picture to employ RATs securely for monitoring,

control and maintenance. In this Recommendation, threats to network configuration due to the use of RATs are identified and security guidelines are provided to adapt secure configuration and security measures for the use of RATs in Internet-connected control systems. Providing well-organized security controls on the use of RATs would be helpful for digital service providers operating control systems to reduce the attack surface and the threats from external networks. Moreover, it would be beneficial to align the security levels between developed and developing countries, since this is not a local problem, but a global problem.

- **ITU-T X.1352 "Security Requirements for Internet of things (IoT) device and gateway"** (under publication) establishes detailed requirements for five security dimensions applicable to Internet of things (IoT) device and gateway: authentication, cryptography, data security, device platform security, and physical security, based on the IoT reference model specified in [ITU-T Y.4100] and the IoT security framework in [ITU-T X.1361]. The authentication dimension includes user authentication, secure use of authentication credentials and device authentication. The cryptography dimension includes the use of secure cryptography, secure key management and secure random number generation. The data security dimension includes secure transmission and storage, information flow control, secure session management and personally identifiable information (PII) management. The device platform security dimension includes five elements: software security; secure update; security management; logging; and timestamp. Likewise, the physical security dimension includes a secure physical interface and tamper-proofing.
- **ITU-T X.1353 "Security methodology for zero-touch deployment in massive IoT based on blockchain"** (under approval): Massive Internet of Things (mIoT) is a significant application of future communication networks. With diverse use cases anticipated in mIoT, it is difficult for manufactures to pre-install their manufactured IoT devices with mobile-operator-specific and/or the service-specific information (e.g., identities and keys), since manufactures may not know where their devices will eventually be deployed and activated. The current approach relies on customers' manual configuration. This is acceptable for small-scale IoT applications. However, for mIoT devices, the aforementioned approach is unacceptable due to the fact that manual configuration is time consuming, cost-ineffective and cumbersome. Thus, automatic credential provisioning without user involvement, known as "zero-touch" is needed for mIoT. This Recommendation provides a security methodology on designing such a decentralized identity management system to support the zero-touch deployment of future mIoT. Zero-touch deployment will enable IoT devices to automatically find their mobile network operator and their service provider, automatically obtain credentials from them and automatically connect to the network and the service. This will greatly facilitate the future deployment of mIoT devices for verticals. The content of this Recommendation will cover the security architecture, the security considerations and the related security procedures (such as device attestations, authentication, and credential provisioning) which are needed for building such a zero-touch mIoT deployment platform.
- **ITU-T X.1369 "Security requirements for IoT service platform"** specifies security requirements for IoT service platform. It assesses security threats and challenges to IoT business service platform and describes security measures that could mitigate security threats and challenges.

- **ITU-T X.1377 "Guidelines for an intrusion prevention system for connected vehicles"** (under approval) establishes guidelines for an intrusion prevention system (IPS) for connected vehicles. This Recommendation mainly focuses on aspects of active response capability for intrusion and includes the implementation guidance and use cases of IPS for connected vehicles. Prior in-vehicle intrusion detection systems (IDSs) have limitations, e.g., requiring too many computing resources that a vehicle cannot provide and being unable to mitigate intrusions due to characteristics of protocol and bus topology. To address these limitations of conventional in-vehicle IDSs, this Recommendation provides methodologies for intrusion detection and intrusion prevention. The proposed IPS consists of the intrusion detection plane – an external component that calculates intrusion detection algorithms – and the data plane – in-vehicle networks (IVNs) where traffic monitoring and active response happen. This Recommendation aims to protect (automotive) Ethernet-based IVNs.
- **ITU-T X.1379 "Security requirements for roadside unit in intelligent transportation system"** specifies security requirements for roadside unit (RSU) in intelligent transportation system (ITS) based on security threat analysis. This Recommendation will help to guide vendors and operators of RSUs to adopt appropriate security schemes to fulfil security requirements specified to protect RSUs from security risks and attacks from cyberspace thus to ensure the security of ITS.
- **ITU-T X.1381 "Security guidelines for Ethernet-based In-Vehicle networks"** (under approval) provides security guidelines for Ethernet-based in-vehicle networks (IVNs). The current trend in electrical and electronic (E/E) architecture is to integrate the Ethernet with legacy IVNs such as the controller area network (CAN), local interconnect network (LIN), media-oriented systems transport (MOST) and FlexRay. In the past, the Ethernet was considered only as a connection between vehicles with external environments. Standard protocols that enable Internet protocol-based connections over the Ethernet (e.g., diagnostic communication over Internet protocol or universal measurement and calibration protocol) have been used to enable communications between the external environment and vehicles. These use cases generally do not need to meet stringent real-time constraints. However, in-vehicle applications using Ethernet communication require characteristics that include high time sensitivity and reliability. Current developments in in-vehicle communication technologies require increased bandwidth in the network. Compared to the Ethernet, legacy IVNs are insufficient to meet the bandwidth requirements of current in-vehicle applications. Therefore, now and in the future, Ethernet-based IVNs are a major part of E/E architecture. However, countermeasures known from common computer networks cannot be suitable for an automotive application because they were not designed with regard to automotive requirements and capabilities. To address this demand, this Recommendation provides security guidelines for automotive Ethernet technology. This Recommendation includes a reference model of automotive Ethernet and analysis of threat and vulnerability for Ethernet-based IVNs. In addition, this Recommendation provides security requirements and use cases of Ethernet-based IVNs.
- **ITU-T X.1382 "Guidelines for sharing security threat information on connected vehicles"** (under approval): Connected vehicles are facing increasingly prominent network security issues along with their rapid development. Security threat information of connected vehicles means any information that can help an organization identify, assess,

monitor, and respond to the connected vehicle, which plays an integral role in securing connected vehicles. Organizations that share threat information for connected vehicles can improve their own security postures and those of other organizations. This Recommendation is a guide on the principles, rules, methodology and procedures of sharing security information for connected vehicles. This Recommendation also provides a brief description of the different scopes, roles and effectiveness of the various organizations while they engage in the life cycle of security threat information sharing. This Recommendation is intended to help organizations stay in touch with the existing shared community. Furthermore, this Recommendation helps organizations contribute to the threat information of a connected vehicles sharing community, which would support the practices of connected vehicles safety protection. Overall, this Recommendation aims to enhance security threat information sharing; and mitigate the potential impact of cyber security attacks on connected vehicles.

- **ITU-T X.1383 "Security requirements for categorized data in vehicle-to-everything (V2X) communication"** (under approval): Data security is one of the most important works for vehicle-to-everything (V2X) communication. However, in a resource constrained environment such as in-vehicle communication, a lot of resources are consumed protecting data as cryptographic functions are required. This Recommendation categorizes the data used in V2X communication into several types such as object attribute data, vehicle status data, environmental perception data, vehicle control data, application service data and user personal data, and assigns three security levels for categorized data types. Based on these categorized data types and assigned data security levels, this Recommendation provides security requirements for categorized data in V2X communication.
- **ITU-T X.1407 "Security requirements for digital integrity proofing service based on distributed ledger technology"** specifies the security threats and requirements in digital integrity proofing based on distributed ledger technology (DLT). The original proof protected is stored in the off-chain. The hashed data values are stored in the on chain. Recommendation X.1407 analyses the security threats to the digital integrity proofing services based on DLT, namely, proof registration and proof provenance. Recommendation X.1407 describes the security requirements that could address these security threats.
- **ITU-T X.1409 "Security services based on distributed ledger technology"**: Distributed ledger technology (DLT) has features include immutability, data sharing, decentralization, and tamper-resistance. Certain security services can benefit from the decentralized nodes of DLT to solve problems such as single point of failure, bottleneck performance and tampering. This Recommendation identifies aspects to be evaluated before delivering a security service based on DLT and provides examples to implement four security services which could be delivered based on DLT, namely:
    - DLT-based public-key certificate management;
    - DLT-based software defined perimeter;
    - DLT-based threat intelligence sharing; and
    - DLT-based security audit.

- **ITU-T X.1410 "Security architecture for data-sharing management based on the distributed ledger technology"** (under approval) specifies a security architecture of data-sharing management based on distributed ledger technologies (DLTs). Based on the architecture, this Recommendation specifies the interfaces between the functional entities and the procedures of data-sharing management based on DLT. Distributed ledger technology is transforming the industries with innovative solutions and changing the way governments, institutions, and businesses operate. It provides a solution for securely replicating, sharing, and synchronizing data across a distributed computer network, considering its decentralization and tamper-proof features. Current approaches for sharing business data and personally identifiable information (PII) data with companies and digital platforms have led to privacy vulnerabilities from hacks or poor data management. Adopting DLT or blockchain in data-sharing management allows individuals or companies to maintain more direct control over their own confidential information. In the DLT-based solution, only non-PII data, e.g., hashed data values, are stored in the on-chain. PII data about a data owner are stored in the off-chain. A DLT-based solution provides a way that improves the traceability, verifiability and changeability of status of data.
- **ITU-T X.1411 "Guidelines on blockchain as a service (BaaS) security"** (under approval) provides generic guidelines for blockchain as a service (BaaS). The security threat and vulnerabilities of blockchain as a service (BaaS) are analysed, followed by the security measures of blockchain as a service (BaaS). The Recommendation addresses the security requirements and provides guidelines for all the activities in the construction, operation and use of BaaS. Blockchain as a service has become a mainstream of blockchain development, due to its promising capability and support from giant tech companies, especially top cloud providers. As blockchain as a service (BaaS) provides the fundamental service and resources for blockchain applications and BaaS security also faces challenges arising from both blockchain core technologies and cloud platforms, the guidance on blockchain as a service security is of great importance and a necessity.
- **ITU-T X.1453 "Security threats and requirements for video management systems"**: Video management system (VMS) is the core of video surveillance systems used for public safety, traffic monitoring, etc. Basically, a VMS receives video from cameras and allows someone to view that video either live or recorded. Currently emerging VMS approaches incorporate more and more intelligence into their design, including video analytics and access control. As VMS is networked, it is fully exposed to various vulnerabilities such as those faced by internet web services and can easily be a target of cyberattacks. This Recommendation analyzes the security threats to server platform based VMS running on an IP network and specifies security requirements to counteract identified security threats.
- **ITU-T X.1454 "Security measures for location enabled smart office service"** (under approval): The smart office service combining multiple smart applications aims to improve the quality of official businesses, and efficiency management. Since information and communication technologies (ICTs) serve as the basis for technologies in smart office services, the telecommunication operator plays an important role among stakeholders in smart office services. The typical smart office services include smart parking, smart driving, smart retail shop, smart office, smart meeting room management, smart water, and smart energy consumption management, etc. Among these typical smart office

services, the location data provided by the operator is one of the key elements in most of these services implementations. In order to ensure the security of location enabled smart office services, security threats and relevant security requirements, specific to location enabled services need to be analysed and the overall security measures established. This draft Recommendation aims to analyse the typical application scenarios of location enabled smart office services, specifies the security threats and requirements that are specific to the location enabled services and thereby establishing security measures for the operator and key stakeholders in a smart office to safeguard location enabled services.

- **ITU-T X.1643 "Security requirements and guidelines of virtualization container in cloud computing environment"** analyses security threats and challenges on virtualization container in cloud computing environment and specifies a reference framework with security guidelines for virtualization container in cloud.
- **ITU-T X.1644 "Security guidelines for distributed cloud"** (under approval) analyses security threats and challenges on distributed cloud and propose security guidelines against threats for distributed cloud, which includes the security guidelines for core cloud, regional cloud and edge cloud.
- **ITU-T X.1715 "Security requirements and measures for integration of quantum key distribution network (QKDN) and secure storage network"** specifies security requirements and measures for integrating quantum key distribution network (QKDN) with secure storage network (SSN) in the service layer [ITU-T Y.3800] and public key infrastructure (PKI) [ITU-T X.509].
- **ITU-T X.1752 "Security guidelines for big data infrastructure and platform"** analyses security threats and challenges on big data infrastructure and platform and specifies a reference framework to mapping security guidelines against threats for big data infrastructure and platform.
- **ITU-T X.1812 "Security framework based on trust relationship for IMT-2020 ecosystem"** identifies stakeholders in IMT-2020 ecosystem, analyses trust relationships amongst them, identifies threats and clarifies security responsibilities for each stakeholder, defines security boundaries between stakeholders, and establishes a security framework based on these trust relationships.
- **ITU-T X.1813 "Security and monitoring requirements for operation of vertical services supporting ultra-reliable and low latency communication (URLLC) in IMT-2020 private network"** (under publication): IMT-2020 private network, also regarded as IMT-2020 non-public network (NPN), is intended for the sole use of a private entity such as an enterprise and may be deployed in a variety of configurations, utilizing both virtual and physical elements. It will deliver speed, low latency and other benefits promised by IMT-2020 to support next-generation applications. In vertical services for smart factories and smart cities that use a private IMT-2020 network, many Internet of things (IoT) devices use massive machine type communications (mMTC) and ultra-reliable low latency communications (URLLC). These communications can be exposed to security threats and their associated risks. In addition, these threats can deteriorate the stable operation of the vertical services supporting URLLC. It cannot be guaranteed when the performance of vertical services is degraded due to these risks. This Recommendation specifies

security requirements for operation of vertical services supporting URLLC in IMT-2020 private network. It identifies threats and risks which arise when providing vertical services supporting URLLC in IMT-2020 private network and describes security deployment scenarios of IMT-2020 private network for operation of vertical services supporting URLLC. Monitoring of communication contents is out of the scope of this Recommendation.

- **ITU-T X.1814 "Security guidelines for IMT-2020 communication system"** (under publication): Connected IoT devices and mobile applications require wireless network access that is resilient, secure, and able to protect individuals' privacy. IMT-2020 communication systems should be designed to meet these high-level requirements. There is a need to define a security framework for IMT-2020 communication systems which could act as a foundation for developing further detailed technical Recommendations on IMT-2020 security topics. This Recommendation identifies all components related to the security of IMT-2020 communication systems and defines security guidelines for the IMT-2020 communication system. It describes a generic IMT-2020 architecture and its domains. It also identifies threats to and specifies requirements on security capabilities for each component, taking into account unique network features. This Recommendation is based on 3GPP 5G security architecture.
- **ITU-T X.1815 "Security guidelines and requirements for IMT-2020 edge computing services"** (under approval): The IMT-2020 network will enable a variety of services, including enhanced mobile broadband (eMBB) services, massive machine type communications (mMTC) based services and ultrareliable low latency communications (URLLC) based services, on an infrastructure of network and computing resources. In line with the key features and the requirements identified for the IMT-2020 network, it is required to be more efficient, personalized, intelligent, reliable and flexible. To support the typical services in the IMT-2020 network, especially eMBB services and URLLC based services, edge computing is acknowledged to be one of the key technologies for meeting the demanding key performance indicators (KPIs) of the IMT-2020 network, especially as far as low latency and bandwidth efficiency are concerned. Edge computing enables the operator and the third part service provider to deploy the services close to the user's access point, thus achieving high-efficiency service delivery through reduced end-to-end latency and load on the transport network. In order to ensure the security of edge computing service deployment and application, the security threats and relevant security requirements specific to edge computing service need to be analysed and the overall security framework need to be established. This Recommendation aims to analyses the deployment scheme and typical application scenarios of edge computing services, specifies the security threats and requirements specific to edge computing services in IMT-2020 and thus establishes security capabilities for the operator to safeguard its applications.
- **ITU-T X.1816 "Guidelines and requirements for classifying security capabilities in IMT-2020 network slice"** (under approval): The definition of basic network slicing technology functions and processes has laid a solid foundation for the first wave of IMT-2020 deployment and commercial use of network slicing services. As an end-to-end logical network that is customized on demand, slicing can provide differentiation security capabilities: First, the IMT-2020 network slicing provides the supporting security measures for the differentiated network implementation. Second, the IMT-2020 network

supports some optional security measures at the slice level. Some security measures can also provide multiple security options and operators may own different security resources. These may bring different degrees of security guarantee or non-security performance. Slice customers also have specific security requirements and may request customized network slices with different security protection levels from slice operators. There exist some challenges for the slice customers or the slice operators choosing the security capabilities of their slices such as management cost and definition inconsistency, etc. The objective of this Recommendation is to provide a description of differentiated IMT-2020 network slice security capabilities and guidance for classifying the IMT-2020 network slice security capabilities and IMT-2020 network slice security to help the ecosystem more clearly understand and choose the slicing security capabilities.

- **ITU-T X.Suppl.37 "Supplement to ITU-T X.1231: Countering spam based on machine learning"** (under publication) defines a technical framework for countering spam based on machine learning. It may help some relevant persons and companies in spam management, reduce the benefit loss of users and providers, improve user experience and promote the healthy development of telecommunication business. This Supplement to Recommendation ITU-T X.1231 provides some general scenarios, characteristics of spam, and define general technical framework, work flows about countering spam based on ML.
- **ITU-T X.Suppl.38 "Supplement to ITU-T X.1152: Use cases for contact tracing applications to prevent spread of infectious diseases"** (under publication) describes various use cases for contact tracing technologies. It also provides data processing models including their procedures, data processing flow and security considerations. In addition, practical use cases are described in Appendix I.
- **ITU-T Y.3807 "Quantum Key Distribution networks – QoS parameters"** specifies an overview on networks supporting quantum key distribution (QKD). For the purpose of design, deployment, operation and maintenance to support QKD network (QKDN) implementation, the required quality level of quantum key distribution service should be identified and quantified. ITU-T Recommendation Y.3806 describes high-level and functional Quality of Service (QoS) requirements for QKDN. This Recommendation helps to quantify what kind of QoS requirements should be monitored and measured for this purpose; QoS parameters. This Recommendation describes QoS and Network Performance (NP) on QKDN and specifies the associated relative parameters for QoS and their definitions.
- **ITU-T Y.3808 "Framework for integration of quantum key distribution network and secure storage network"**: For quantum key distribution networks (QKDN), this Recommendation provides an overview of secure storage networks (SSNs). It specifies functional requirements, functional architecture model, reference points and operational procedures for SSNs.
- **ITU-T Y.3808 "Framework for integration of quantum key distribution network and secure storage network"**: For quantum key distribution networks (QKDN), this Recommendation provides an overview of secure storage networks (SSNs). It specifies functional requirements, functional architecture model, reference points and operational procedures for SSNs.

- ITU-T Y.3809 "Quantum Key Distribution Networks - Business role-based models" provides an overview of secure storage networks (SSNs) for quantum key distribution networks (QKDNs). It specifies the functional requirements, functional architecture model, reference points and operational procedures for SSNs.
- **ITU-T Y.3810 "Quantum key distribution network interworking – framework" (under approval)**: For quantum key distribution networks (QKDN), Recommendation ITU-T Y.3810 specifies framework of QKDN interworking (QKDNi). This Recommendation describes the overview of interworking QKDNs, the reference models, and the functional models of gateway functions (GWFs) and interworking functions (IWFs). The configurations for QKDNi are specified. Appendix I includes QKDNi with different key relay schemes.
- **ITU-T Y.3811 "Quantum key distribution networks - Functional architecture for quality of service assurance" (under approval)** specifies a functional architecture of QoS assurance for the quantum key distribution networks (QKDN). This recommendation first provides an overview of the functional architecture of QoS assurance for the QKDN. It then describes the functional architecture of QoS assurance which includes functional entities such as QoS data collection, data processing, data storage, data analytics, QoS anomaly detection and prediction, QoS policy decision making, and enforcement and reporting. Based on the functional entities described in the functional architecture, this Recommendation specifies a basic operational procedure of QoS assurance for the QKDN.
- **ITU-T Y.3812 "Quantum key distribution networks - Requirements for machine learning based quality of service assurance" (under approval)** specifies high-level and functional requirements of machine learning (ML) based QoS assurance for the quantum key distribution networks (QKDN). This recommendation first provides an overview of requirements of ML based QoS assurance for the QKDN. It describes a functional model of ML based QoS assurance and followed by associated high level and functional requirements of ML based QoS assurance. And some use cases are described.
- **ITU-T Y.4500.3 "oneM2M - Security solutions" (under approval)** provides specifications for M2M security and privacy protection.
- ITU-T Technical Report XSTP-5Gsec-RM "5G Security Standardization Roadmap" provides the standardization roadmap for 5G security. This roadmap is prepared to assist in developing 5G security standards by providing information on existing and under developing standards at key standards developing organizations (SDOs). In addition, it describes the overviews of 5G security from standards perspective and gap analysis.
- ITU-T Technical Report TR.sec-ai "Guidelines for security management of using artificial intelligence technology": As a new generation of information and communication technology (ICT) infrastructure, Artificial Intelligence (AI) has been widely used in various fields of social economy. In the development and application of AI technology, AI may also bring some security threats, which may run through the whole process of AI products, applications and services from design and development to retirement. Organizations need to identify the source of security threats according to the using process of AI technology, so as to deploy targeted security defense strategies. This Technical Report focuses on the security threats faced by the current use of AI technology, puts forward

AI security management suggestions, and provides a useful reference for organizations to improve the security protection ability in the use of AI technology.

- **ITU-T Technical Report TR.hyb-qkd "Overview of hybrid approaches for key exchange with QKD"** provides a landscape of the standardization activities on hybrid approaches for migration towards quantum-safe algorithms or protocols within international, regional and national organizations. The hybrid approach that is covered by this technical report is for key exchange. Hybrid approaches are for key exchange consist in generating a key exchange functionality by combining at least two different key exchange methods. This Technical Report studies the possible way forward to accommodate Quantum Key Distribution protocols in the context of the hybrid approaches for key exchange. This compatibility is studied for generic hybrid key exchange and hybrid key exchange specific to certain communication protocols.

95. ITU-T Study Group 20 determined draft Recommendation ITU-T Y.4500.3 "oneM2M - Security solutions" (under approval) provides specifications for M2M security and privacy protection.

96. Additionally, ITU-T Study Group 5 works on the safety and security of ICT systems and revised Recommendation ITU-T K.87 "Guide for the application of electromagnetic security requirements – Overview". This Recommendation outlines electromagnetic security risks of telecommunication equipment and illustrates how to assess and prevent those risks, in order to manage the information security management system (ISMS) in accordance with Recommendation ITU-T X.1051.

97. Several ITU-T Focus Groups are exploring the trust aspect of various emerging technologies as part of their work. These include (1) ITU-T Focus Group on Testbeds Federations for IMT-2020 and beyond (FG-TBFxG) (2) ITU/FAO-T Focus Group on "Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture" (FG-AI4A) (3) ITU/WMO/UNEP-T Focus Group on AI for Natural Disaster Management (FG-AI4NDM) (4) ITU-T Focus Group on Autonomous Networks (FG-AN) (5) ITU-T Focus Group on AI for autonomous and assisted driving (FG-AI4AD) (6) ITU-T Focus Group on "Environmental Efficiency for Artificial Intelligence and other Emerging Technologies" (FG-AI4EE) (7) ITU/WHO-T Focus Group on Artificial Intelligence for Health (FG- AI4H), and (8) ITU-T Focus Group on Vehicular Multimedia (FG VM).

98. ITU-R's work in radiocommunication standardization continues, matching the constant evolution in modern telecommunication networks. ITU-R established clear security principles for IMT (3G, 4G and 5G) networks (Rec. ITU-R M.1078, M.1223, M.1457, M.1645, M.2012 and M.2083). It has also issued Recommendations on security issues in network management architecture for digital satellite systems (Rec. ITU-R S.1250) and performance enhancements of transmission control protocol over satellite networks (Rec. ITU-R S.1711). Information related to Futuristic mobile technologies foresee "IMT for 2020 and beyond" can be found on the website.

(iii) Organizational Structures (SDG 1 (1.4), SDG 7 (7.1, 7.a, 7.b), SDG 9 (9.1, 9.c), SDG 11 (11.3, 11.b), SDG 17 (17.8))

99. In 2021, ITU conducted technical assessments to evaluate the preparedness for the establishment of Computer Incident Response Teams (CIRTs) in more than 80 countries and is taking the necessary follow-up actions to assist the Member States in implementation.

100. Till date, ITU has organized 34 CyberDrills involving more than 120 countries. During September-December 2021, ITU has organized and executed the ITU 2021 Global CyberDrill through several online events consisting of regional dialogues, technical and policy webinars, tools use and skills development trainings, as well as two sub-regional CyberDrills for ECOWAS and SADC countries and one national CyberDrill for India . Also, two publications "Operational framework and guidelines for the planning and execution of ITU regional CyberDrills" and "ITU cybersecurity programme: CIRT framework" were developed in 2021.

(iv) Capacity Building (SDG 1 (1.4), SDG 7 (7.1, 7.a, 7.b), SDG 9 (9.1, 9.c), SDG 11 (11.3, 11.b), SDG 17 (17.8))

101. BDT continues to organize regional cybersecurity forums for all ITU regions, using them as a capacity-building vehicle for different BDT programmes and activities as well as an operational platform for cooperation at the regional and international level.

102. ITU facilitated the process to update The Guide to Developing a National Cybersecurity Strategy (NCS). More than 20 organizations contributed to the second edition of the Guide which was launched in November 2021 through a global webinar which discussed the lifecycle development and implementation of a NCS, highlighted challenges and opportunities and called for more cooperation. Technical assistance activities on NCS have commenced with Bahamas, Rwanda, Morocco and the SADEC region, and there are ongoing discussions with other Member States that need assistance. ITU also finalized and made available the online training "Lifecycle, principles and good practices of national cybersecurity strategy development and implementation" on the ITU Academy platform in several languages. ITU is partnering with the World Bank Group to organize regional webinars to provide operational insights on how to develop an NCS action plan. ITU is developing an NCS Benchmarking tool to support Member States and cybersecurity practitioners in their NCS efforts. Through the ITU Academy, the ITU Centres of Excellence (CoE) continue to deliver training activities and workshops in various areas of the cybersecurity domain.

103. The fourth edition of the ITU Global Cybersecurity Index (GCI) Report has been released on June 29th 2021. This edition of the index covers 193 Member States and the State of Palestine, with 169 countries' contributions to the data. The work on an updated questionnaire for the GCI has already started and the new set of documents is planned to be virtually presented to ITU-T Study Group 2 Question 3 in October 2021.

104. To promote the involvement of young people in the field of cybersecurity and to raise awareness on the field's worldwide workforce shortage, ITU is planning activities and collaborations for and by youth under the umbrella of the Generation Connect Initiative.

105. ITU has successfully completed the first edition of the Women in Cyber Mentorship Programme targeted at building the capacity of junior women professionals who wish to

enter or thrive in the field of cybersecurity. A new cohort began in April 2022, with target groups residing in Africa, Arab and Asia-Pacific regions.

(v) International Cooperation (SDG 1 (1.4), SDG 7 (7.1, 7.a, 7.b), SDG 9 (9.1, 9.c), SDG 11 (11.3, 11.b), SDG 17 (17.8))

106. ITU is developing relationships and partnerships with various regional/international organizations and initiatives, including Commonwealth Cybercrime Initiative, ENISA, INTERPOL, ECOWAS, the World Bank, FIRST, and regional CSIRT/CERT associations, such as AP CERT, AFRICA CERT, and OIC CERT.

107. The 2022 session of Council approved the guidelines developed for utilization of the GCA by the ITU for transmission to 2022 ITU Plenipotentiary Conference.

108. As the lead facilitator for WSIS Action Line C5, ITU organized a dedicated cybersecurity track comprising several sessions at the WSIS Forum 2022, including an Action Line C5 facilitator session on "Privacy-Preserving Techniques", and a High-Level Dialogue on "From the lab to the real world: Artificial Intelligence and the decade action".

(vi) The Child Online Protection (COP) Global Initiative (SDG 4 (4.1, 4.5) and SDG 16 (16.2))

109. Within the framework of the GCA, the Child Online Protection (COP) Initiative was established by ITU as an international collaborative network for action to promote the online protection of children worldwide.

110. ITU has been raising awareness on COP issues and building capacity through organizing workshops, strategic dialogues and regional forums, holding several workshops at different international conferences and leading or participating in different projects.

111. ITU has signed a collaboration agreement with the SCORT Foundation on COP. ITU has contributed to many discussions such as the Safer Internet Day 2021 and the 15th and 18th European Football for Development Conference as well as in a round table discussion with European Football Clubs. ITU, SCORT and partners have released recommendations for sports clubs and associations on how to include online safety measures into safeguarding efforts for children in sports.

112. The Kingdom of Saudi Arabia and ITU signed an agreement to implement a three-year global programme on 'Creating a safe and empowering cyber environment for children', which focuses both on policy assistance for governments and development of digital skills and literacy with end-users. The implementation of the program started in 2021 with the signature of an ITU internal project document. ITU has started implementing the project focusing on capacity building through the development of online self-paced trainings for all relevant stakeholders and other interactive solutions like a game and an app for children and young people to become responsible digital citizens.

113. All ITU regions started implementing activities of the Global programme on 'Creating a safe and empowering cyber environment for children'. The first implementing country was Albania, followed by Armenia, Kazakhstan, Malawi, and Morocco.

114. Together with the Office of the UN Special Representative of the Secretary General on Violence Against Children, and selected partners, ITU started an initiative on *Protection through online participation* (POP), aiming at providing recommendations to all relevant stakeholder groups based on a global mapping of the current ways that children and young people use the digital environment to access protection services, support each other, and stay safer, both online and offline, and to better understand the effectiveness of these systems.

115. ITU delivered an interactive learning session at the ITU's Global Youth Summit held in Kigali, Rwanda in 2022.

116. ITU celebrated Safer Internet day 2021 with various communications, including a blog post on the application of the COP Mascot in a national drawing competition in Hungary. The COP Mascot furthermore moderated different virtual events, such as among others the Online Safety Moment at the Girls in ICTs Day Celebration and the Session 4: Safe Digital Inclusion - Child Online Protection at GSR2021.

117. The COP Mascot furthermore announced a collaborative project with Eni and Deloitte Italia to raise awareness and build capacity on online safety with children and educators. In five video episodes, the Online Safety Course with Sango provided practical advice to children up to 9 years old on risks that they can face online.

118. Through the ITU Academy, ITU provided an instructor led training session for regulators on the Arab Region on child online protection.

Action Line C6: Enabling Environment

Related to the SDGs: SDG 2 (2.a), SDG 4 (4.4), SDG 5 (5.b), SDG 8 (8.2, 8.3), SDG 9 (9.1, 9.c), SDG 10 (10.3), SDG 11 (11.3, 11.b), SDG 16 (16.3, 16.6, 16.7, 16.10, 16.b), SDG 17 (17.6, 17.14, 17.16)

119. Recognizing the strong commitment of ITU's work towards bridging the digital divide in the area of the enabling an ICT policy and regulatory environment, ITU is leading the facilitation role on WSIS Action Line C6 Enabling Environment as the sole facilitator building upon its regular work carried out within the framework of the ITU-D Objective 3: Enabling environment: Foster an enabling policy and regulatory environment conducive to sustainable telecommunication/ICT development.

120. The 17th Action Line C6 Facilitation Meeting was held as an integral component of the WSIS Forum 2022, on Tuesday, 10 May 2022. The theme of this year was: "Economic and fiscal incentives to accelerate digital transformation"**.** This session was aligned with the 9th Economic Experts Roundtable which was organized within the framework of WSIS Forum 2022, specifically under Action Line C6 on Enabling Environment. Details of the session are available here.

121. Discussions focused on how potential asymmetries in economic incentives implemented across all sectors of the digital economy and imbalances across sectors and sub-sectors of the digital economy can be addressed. Participants also discussed potential fiscal incentives to stimulate the deployment of digital infrastructure in rural and isolated areas as well as the role of ICT National Regulatory Authorities (NRAs). Finally, participants debated on the type of economic incentives to ensure the introduction of advanced technologies such as 5G, fiber optics, and cloud-services to support digital transformation of the economy.

122. This session on Action Line 6 was mostly linked to the SDG 9 and SDG 11.

123. The WSIS Prizes 2022 Winner for the Action Line C6 is **Construction of the 2030 Digital Agenda**, Dominican Republic. Details of the project are available here.

124. ITU has undertaken numerous activities that foster the development of an enabling environment worldwide including High Level Exchange Platforms on ICT Policy and Regulation for Digital transformation, ICT Policy and Regulation Data and Knowledge Platforms for evidence-based decision making, and support for the development and strengthening of ICT Policy and Regulatory Frameworks and Capacity Development. The main purpose is to provide the platforms and tools for effective policy, legal and regulatory frameworks to support regulators and policymakers in driving inclusive and cross-sectoral collaboration so that all stakeholders have their voices heard and create a virtuous dynamic for the digital transformation.

125. ITU-D provides knowledge exchange tools and platforms to enable inclusive dialogue and enhanced cooperation to help countries leap forward and achieve a more inclusive digital society and to raise national and regional awareness about the importance of an enabling environment for digital transformation.

126. ITU-D continues providing direct assistance to countries and regions on an enabling environment for digital transformation.

127. ITU-D provides knowledge exchange tools and platforms such as the Global Symposium for Regulators (GSR), Regional Regulatory Roundtables and Regional Economic Dialogues (RED) to enable inclusive dialogue and enhanced cooperation to help countries achieve a more inclusive digital society and to raise national and regional awareness about the importance of an enabling environment.

    - The annual Global Symposium for Regulators (GSR) provides a neutral platform for ITU members to share their views on major issues facing the ICT sector and concludes with the adoption by regulators of a set of regulatory GSR Best Practice Guidelines.

    - Over the years, the GSR Best Practice Guidelines have shaped a regulatory evolution towards an open, collaborative and innovative approach. For example, since the 2004 guidelines on broadband, the number of countries with a National Broadband Plan quadrupled, from a dozen in 2007 to 168 in 2019. Other precursing guidelines include VoIP in 2007, infrastructure sharing in 2009 or regulatory openness mentioned in 11 editions of the guidelines.

- The GSR-21 Programme (GSR+), was held virtually as a series of interconnected regional and virtual events across all regions from April to June 2021 to discuss regional regulatory and economic perspectives, challenges and innovative solutions in the lead up to core global sessions from 21 to 25 June 2021, held under the theme Regulation 4 digital transformation: Accelerating inclusive connectivity, access and use. The core sessions (GSR-21), held online from 21 to 25 June, attracted 637 participants, including 439 delegates representing 115 Member States countries, that included Government Ministry officials, Heads of Regulatory Authorities and C-level industry executives. the 2021 GSR was fully aligned and integrated into the lead up to WTDC-21, with its traditional Leadership Debate becoming a stop on the Road to Addis. The 22nd Global Symposium for Regulators (GSR-22) will be held from 21 to 23 November 2022, online, under the theme: Regulation for a sustainable digital future. In addition to the high-level panels on topical, cutting edge policy and regulatory issues, GSR-22 will feature interactive sessions and trainings, bringing together regulators and policy makers from around the world and providing a global platform for discussions.

128. ITU-D has its "eye" on ICTs and is recognized around the globe as the leading provider of timely and comprehensive telecommunication/ICT indicators as well as regulatory and tariff policies statistics, profiles and trends. ITU data, research and analysis and tools support stakeholders in defining, elaborating, implementing and reviewing transparent, coherent and forward-looking strategies, policy, legal and regulatory frameworks as well as in moving towards evidence-based decision-making.

    - The ICT Regulatory Tracker is a composite metric based on a total of 50 indicators grouped into four clusters: 1. Regulatory authority (focusing on the functioning of the separate regulator), 2. Regulatory mandates (who regulates what), 3. Regulatory regime (what regulation exists in major areas) and 4. Competition framework for the ICT sector (level of competition in the main market segments). The Tracker covers between 190 and 193 countries and economies over the period 2007 – 2020. To help analyse the evolution of ICT regulation worldwide, identify progress areas as well as gaps and measure those, the countries included in the Tracker are split into score thresholds that relate to generations of regulation, for any given year. Generation 1 (G1) to Generation 4 (G4) presents the evolution in telecommunication and ICT regulation, starting from the command-and-control regime typically associated with state-owned monopolies, through privatization and liberalization, the need to encourage investment, and the shift to meeting socio-economic objectives.

    - The 2021 G5 Benchmark covers 193 countries and calibrates data on 70 indicators against four pillars: 1. National Collaborative Governance; 2. Policy Design Principles; 3. Digital Development and 4. Digital Economic Policy Agenda. While a sizable group of countries have reached leading and advanced G5 Benchmark scores (67 countries or 34 per cent of the sample),

most countries still need to fulfil the conditions required for those levels of readiness for digital transformation.

129. ITU-D provides Membership with innovative tools and assistance to help countries leap forward.

- The G5 accelerator provides high-value tools and resources offering practical step-by-step support for countries already embarked or planning to embark on their digital transformation journey, and the ICT Policy Impact Lab explores the impact of policies and regulations on ICT investment.
- ITU has led the research and analysis on collaborative regulation while at the same time building a global community around it – it is a community-owned programme of work. A series of country case studies articulate the benefits of G5 regulation at country level, and anchors these benefits in experience and evidence. Each of the collaborative regulation case studies offers a high-value, authoritative analysis of the country regulatory landscape and a clear-eyed view of the path ahead towards G5 regulation.
- ITU and the World Bank have been collaborating since 2000 to support countries with these rapid changes and have launched the Digital Regulation Handbook and Platform to provide the latest information on developments of regulation strategies, best practices, and case studies. The thematic sections, regularly updated, tackle new regulatory aspects and tools to consider when making regulatory decisions to harness the benefits of the digital economy and society.
- The Global ICT Regulatory Outlook (GIRO) series lays out a broad canvas of how regulation and digital markets are interacting – and advocates for collaborative regulatory reform in delivering meaningful connectivity and inclusive digital markets. This series explores the evolution of ICT regulatory trends and first set out the ITU concept of five 'generations', sharing unique, focused research and offer both evidence and practical advice to support regulators embarked on their journey to fifth generation collaborative regulation.
- With the REG4COVID platform, ITU has been leading research efforts into the telecommunication/ICT sector response to COVID-19, bringing together more than 500 measures taken by the regulatory community, private sector and civil society, and showing how we can come together as a community and how collaboration can help countries in challenging situations. With this research, the confirmation of the economic contribution of ICTs throughout 2020 and the assessment of the value of broadband in mitigating economic disruption caused by the pandemic provide support for the measures taken so far by policy makers and regulators to accommodate the resulting changes in sector dynamics.
- A series of expert reports quantified the positive economic impact of broadband, digital transformation and the interplay of ICT regulation both at regional and global levels. The main outcomes from the econometric

modelling by region suggest that an increase of 10 per cent in mobile broadband penetration would yield an increase in 2.46 per cent in GDP per capita in the Africa region, while the increase in GDP per capita would be of 1.73 per cent in the Americas region, 1.82 per cent in the Arab States region, 0.51 per cent in the Asia-Pacific region, 1.25 per cent in CIS region. In the Europe region, countries would enjoy an increase of 2.1 per cent. The new *2020 Report on How broadband, digitization and ICT regulation impact the global economy* sets out six powerful and concrete steps which will maximize the economic impact of strategic ICT investment decisions, as well as concrete recommendations designed to boost economic impact.

- A 2021 Report on The impact of policies, regulation, and institutions on ICT sector performance uses econometric modelling to pinpoint the impact of the regulatory and institutional frameworks on the performance of the ICT sector and its contribution to national economies. The modelling has allowed to capture fresh insights backed by authoritative data on the evolution of ICT regulation since 2007, the ICT Regulatory Tracker, and a global dataset on ICT markets economics.

- A 2021 ITU Report on Financing Universal Access to Digital Technologies and Services provides guidance on the policy and regulatory frameworks needed to attract greater private sector participation in financing universal connectivity, access and uptake, and explores business models for deploying supply and demand side projects and initiatives in the digital era.

130. ITU-D continues to implement a project to harness the potential of Information and Communication Technologies (ICTs) to strengthen Digital Financial Services (DFS) and Digital Financial Inclusion (DFI) in China, Egypt and Mexico. Within this context, ITU-D is raising awareness on the enabling environment for Financial Inclusion in these countries through the preparation of draft country assessment reports, research on issues relating to ICTs for Digital Financial Inclusion, workshops on collaborative regulation, security and Quality of Service (QoS), and is working with the countries to define further priority areas of leveraging ICTs for DFI as part of the Financial Inclusion Global Initiative.

131. ITU web portals bring together in one place information on International Mobile Roaming (IMR) Resources , Quality of Service, the Digital Ecosystem, Infrastructure and Connectivity Development Frameworks. In addition, the Regional Regulatory Associations Portal is continually updated to bring together regulatory resources and ITU activities on such issues as well as activities and initiatives by Regulatory Associations, regional and international organizations and other stakeholders. These portals also highlight key findings from ITU publications, studies, research, ITU Study Groups, and data and analysis from the ITU ICT Eye.

132. ITU-D provides training and capacity development for regulators and other stakeholders to address digital policy, regulation as well as economic and market developments and collaborative regulatory approaches for digital transformation.

- ITU, USTTI, and World Bank Group (WBG) collaborated to conduct a regulatory best practice training in Nairobi, Kenya, for officials from Eswatini,

Ethiopia, Kenya, Somalia, South Sudan, and Sierra Leone. With important support from the Communications Authority of Kenya and the African Telecommunications Union (ATU). The three-day programme addressed the role of an independent communications regulator, licensing frameworks and regulatory best practices that spur investment.

- Ahead of the celebrations of the 20th edition of GSR (in 2021), USTTI and ITU teamed up to provide a behind the scenes look at the work taking place to prepare for the deployment and usage of emerging technologies. Experts provided regulators with information on the technological underpinnings of emerging technologies and the spectrum planning that is taking place to enable these new services. The GSR-21 joint ITU-USTTI training provided regulatory officials with information and insights on how emerging technologies can accelerate the digital transformation process, and how such smart technologies and innovation have so far strengthened digital resilience. This training session saw experts further discuss how these emerging technologies interact with key policy and regulatory trends.

- ITU is developing training materials for regulators jointly with the World Bank as part of the Digital Regulation Handbook and platform. These training resources consist of a series of self-paced e-learning modules on regulatory governance, spectrum management, access for all, competition and economics, and consumer affairs, to be made available in the 4th quarter of 2021. An online training programme on digital regulation was developed with CITC Saudi Arabia for delivery in two phases. Phase 1 focusing on regulatory governance and collaborative regulation took place on 29 and 30 March 2021, phase 2 will take place in December 2021.

- ICT infrastructure is the basis of today's digital economy and offers enormous potential to advance progress towards the UN Sustainable Development Goals (SDG) and improve people's lives in fundamental ways. Deploying broadband in big towns and cities happens almost naturally. But deploying these networks to rural and remote areas is markedly more challenging. ITU launched the ICT Infrastructure Business Planning toolkit and training to support regulators in designing optimal broadband network that can respond and adapt to a wide range of infrastructure deployment projects.

133. **ITU-D Study Groups** examine specific task-oriented telecommunication/ICT questions of priority to developing countries, to support them in achieving their development goals and SDG targets. Study questions relevant to Action Line C6 in ITU-D Study Group 1 include: *Question 1/1*: Strategies and policies for the deployment of broadband in developing countries, *Question 3/1*: Emerging technologies, including cloud computing, m-services, and OTTs: Challenges and opportunities, economic and policy impact for developing countries, *Question 4/1*: Economic policies and methods of determining the costs of services related to national telecommunication/ICT networks, *Question 5/1*: Telecommunications/ICTs for rural and remote areas, *Question 6/1:* Consumer information, protection and rights: Laws, regulation, economic bases, consumer networks, and *Question*

7/1: Access to telecommunication/ICT services by persons with disabilities and other persons with specific needs do.

134. Outputs agreed on in the ITU-D Study Groups, and related reference material, are used as input for the implementation of policies, strategies, projects and special initiatives in Member States. These activities also serve to strengthen the shared knowledge base of the membership. (http://www.itu.int/ITU-D/study-groups).

135. Additional details about other activities implemented by BDT in all ITU regions can be found in BDT's quarterly and annual performance reports: <https://www.itu.int/en/ITU-D/Pages/OperationalPlansPerformanceReports.aspx>.

136. International mobile roaming remains an important area of work for ITU-T SG3.

137. ITU also provides support, assistance and training to developing countries with the aim of bridging the standardization gap (BSG) on ICT technologies. ITU-T has 23 Regional Groups to stimulate effective participation in ITU-T Study Groups and increase the number of quality Contributions from the various regions - eight in Africa, four in the Americas, five in the Arab region, two in the APT region and four in the Eastern Europe, Central Asia and Transcaucasia. ITU-T also continues to offer a mentoring programme for new delegates to ITU-T Study Groups. Remote participation is offered during all study group meetings and Closing plenaries benefit from full interpretation.

138. ITU organizes annual Regional ICT Standardization Forums as part of activities under WTSA Resolution 44 on bridging the standardization gap. The Forums discuss current standardization topical issues in ITU-T study groups and focus groups to engage more developing countries in the standardization work and could also feature capacity building on ITU-T Recommendations. Regular BSG trainings are also organized in collocation with Study Group meeting in order to equip delegates from developing countries with right skills to contribute to the standards development process at the ITU.

139. ITU-T study groups developed the following Recommendations and other texts on the network aspects of IMT-2020:

- **ITU-T K.Suppl.16 (revised) "Electromagnetic field compliance assessments for 5G wireless networks" (under publication)** provides guidance on the radio frequency electromagnetic field (RF-EMF) compliance assessment considerations for IMT 2020 wireless networks also known as 5G. Given that the 5G technical standards have just been finalised and commercial 5G networks are not due to be launched before 2019-2020, the first version of this Supplement is to mainly address the computational assessment options and the assessments of trial networks.

- **ITU-T L.Suppl.48 "Data center energy saving: Application of artificial intelligence technology in improving energy efficiency of telecommunication room and data center infrastructure" (under publication)**: Telecommunication Room and Data Center (DC) Infrastructure is containing a huge number of Information and Communication equipment. In order to keep the equipment running continuously and reliably, the room is necessarily equipped with air-conditioners to create a suitable environment for equipment operation. Nevertheless, it will cause a large amount of energy consumption and carbon emissions. This Supplement focuses on the application of AI technology and

other emerging technologies such as digital twin, to improve the energy efficiency and reduce the carbon emissions of telecommunication room and DC infrastructures.

- **ITU-T L.1390 "Energy saving technologies and best practices for 5G RAN equipment" (under approval):** With the rapid development and commercialization of 5G radio communication technology, the 5G network construction is further accelerated. While being an important enabler for digitalization of other industries and thereby contribute to significant energy savings and emission reductions, it is also important to consider the energy consumption of the 5G network infrastructure itself. This Recommendation identifies energy saving potentials, describes energy-saving principles and technologies for 5G RAN and related equipment, and provides best practice recommendations when and how these technologies should be used and controlled thereby reducing the 5G RAN energy consumption, saving operational costs, and making the 5G RAN a green and high-efficiency network.

- ITU-T M.3381 "Requirements for energy saving management of 5G RAN system with AI" provides requirements for energy saving management of 5G RAN system with artificial intelligence (AI). The goal of the Recommendation is to explain the requirements of using AI technology to achieve energy saving management for communication units and virtualized hardware resources of 5G RAN system, via EMS and open interfaces provided by vendors, from the OSS level. In addition, this Recommendation includes process recommendations for sending intelligent energy saving strategies from OSS to EMS and then to wireless equipment. This Recommendation describes functional requirements for energy saving management of 5G RAN system with AI, and it also describes use cases of energy saving management of 5G RAN system with AI.

- **ITU-T Q.5025 "Protocol for managing User Plane function in IMT-2020 network" (under approval)** specifies protocol for managing user plane function (UPF) in IMT-2020 network. It describes the communication mechanism inside UPF. It also describes API management, procedure, signalling flow and message format between UPF and other core network functions or third-party applications.

- ITU-T X.1812 "Security framework based on trust relationship for IMT-2020 ecosystem" identifies stakeholders in IMT-2020 ecosystem, analyses trust relationships amongst them, identifies threats and clarifies security responsibilities for each stakeholder, defines security boundaries between stakeholders, and establishes a security framework based on these trust relationships.

- **ITU-T X.1813 "Security and monitoring requirements for operation of vertical services supporting ultra-reliable and low latency communication (URLLC) in IMT-2020 private network"** (under publication): IMT-2020 private network, also regarded as IMT-2020 non-public network (NPN), is intended for the sole use of a private entity such as an enterprise and may be deployed in a variety of configurations, utilizing both virtual and physical elements. It will deliver speed, low latency and other benefits promised by IMT-2020 to support next-generation applications. In vertical services for smart factories and smart cities that use a private IMT-2020 network, many Internet of things (IoT) devices use massive machine type communications (mMTC) and ultra-reliable low latency communications (URLLC). These communications can be exposed to security threats

and their associated risks. In addition, these threats can deteriorate the stable operation of the vertical services supporting URLLC. It cannot be guaranteed when the performance of vertical services is degraded due to these risks. This Recommendation specifies security requirements for operation of vertical services supporting URLLC in IMT-2020 private network. It identifies threats and risks which arise when providing vertical services supporting URLLC in IMT-2020 private network and describes security deployment scenarios of IMT-2020 private network for operation of vertical services supporting URLLC. Monitoring of communication contents is out of the scope of this Recommendation.

- **ITU-T X.1814 "Security guidelines for IMT-2020 communication system"** (under publication): Connected IoT devices and mobile applications require wireless network access that is resilient, secure, and able to protect individuals' privacy. IMT-2020 communication systems should be designed to meet these high-level requirements. There is a need to define a security framework for IMT-2020 communication systems which could act as a foundation for developing further detailed technical Recommendations on IMT-2020 security topics. This Recommendation identifies all components related to the security of IMT-2020 communication systems and defines security guidelines for the IMT-2020 communication system. It describes a generic IMT-2020 architecture and its domains. It also identifies threats to and specifies requirements on security capabilities for each component, taking into account unique network features. This Recommendation is based on 3GPP 5G security architecture.

- **ITU-T X.1815 "Security guidelines and requirements for IMT-2020 edge computing services"** (under approval): The IMT-2020 network will enable a variety of services, including enhanced mobile broadband (eMBB) services, massive machine type communications (mMTC) based services and ultrareliable low latency communications (URLLC) based services, on an infrastructure of network and computing resources. In line with the key features and the requirements identified for the IMT-2020 network, it is required to be more efficient, personalized, intelligent, reliable and flexible. To support the typical services in the IMT-2020 network, especially eMBB services and URLLC based services, edge computing is acknowledged to be one of the key technologies for meeting the demanding key performance indicators (KPIs) of the IMT-2020 network, especially as far as low latency and bandwidth efficiency are concerned. Edge computing enables the operator and the third part service provider to deploy the services close to the user's access point, thus achieving high-efficiency service delivery through reduced end-to-end latency and load on the transport network. In order to ensure the security of edge computing service deployment and application, the security threats and relevant security requirements specific to edge computing service need to be analysed and the overall security framework need to be established. This Recommendation aims to analyses the deployment scheme and typical application scenarios of edge computing services, specifies the security threats and requirements specific to edge computing services in IMT-2020 and thus establishes security capabilities for the operator to safeguard its applications.

- I**TU-T X.1816 "Guidelines and requirements for classifying security capabilities in IMT-2020 network slice"** (under approval): The definition of basic network slicing technology functions and processes has laid a solid foundation for the first wave of

IMT-2020 deployment and commercial use of network slicing services. As an end-to-end logical network that is customized on demand, slicing can provide differentiation security capabilities: First, the IMT-2020 network slicing provides the supporting security measures for the differentiated network implementation. Second, the IMT-2020 network supports some optional security measures at the slice level. Some security measures can also provide multiple security options and operators may own different security resources. These may bring different degrees of security guarantee or non-security performance. Slice customers also have specific security requirements and may request customized network slices with different security protection levels from slice operators. There exist some challenges for the slice customers or the slice operators choosing the security capabilities of their slices such as management cost and definition inconsistency, etc. The objective of this Recommendation is to provide a description of differentiated IMT-2020 network slice security capabilities and guidance for classifying the IMT-2020 network slice security capabilities and IMT-2020 network slice security to help the ecosystem more clearly understand and choose the slicing security capabilities.

- **ITU-T Technical Report XSTP-5Gsec-RM "5G Security Standardization Roadmap"** provides the standardization roadmap for 5G security. This roadmap is prepared to assist in developing 5G security standards by providing information on existing and under developing standards at key standards developing organizations (SDOs). In addition, it describes the overviews of 5G security from standards perspective and gap analysis.

- **ITU-T Y.3078 "Information centric networking for IMT-2020 and beyond - Requirements and capabilities of data object segmentation"** starts with the introduction to data object segmentation in information centric networking (ICN) for IMT-2020 and beyond. It specifies the service and functional requirements and capabilities of data object segmentation achieve high efficiency of caching and forwarding in ICN.

- **ITU-T Y.3114 "Future networks including IMT-2020: requirements and functional architecture of lightweight core for dedicated networks"**: In the context of future networks including IMT-2020, dedicated networks are networks designed for application domains with common requirements. Lightweight core is a core network designed for dedicated networks, which builds on the integration of IMT-2020 core network functions. This Recommendation specifies requirements, functional architecture, reference points, and procedures of lightweight core for dedicated networks.

- **ITU-T Y.3115 "AI enabled cross-domain network architectural requirements and framework for future networks including IMT-2020"** points out the problem that the current network domains lack an architecture to coordinate the artificial intelligence (AI) capabilities, and specifies architectural requirements and framework of AI enabled cross-domain network for future networks including IMT-2020, which aim to achieve overall network intelligence.

- **ITU-T Y.3116 "Traffic typization IMT-2020 management based on an artificial intelligent approach"**: At present, the standardization of IMT-2020 networks aims at

dealing with architectural issues (infrastructure and new services), analyzing and ensuring signaling at the management level and ensuring the quality and security of IoT services. As is well known, according to ITU-R Recommendation ITU-R M.2083-0 "IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond", one of the IMT-2020 infrastructure technologies is SDN. Given the heterogeneous nature of the traffic, it is necessary to ensure efficient and effective infrastructure management. With a view to increasing the effectiveness of the automation of management, the use of artificial intelligence (AI) technologies needs to be considered for traffic detection and typization. In this way, Recommendation considering the following: an overview of machine learning (ML) technologies for the traffic detection and method of the traffic typization and recognition for IMT-2020 management based on an ML approach.

- **ITU-T Y.3138 "Unified multi-access edge computing for supporting fixed mobile convergence in IMT-2020 networks" (under approval):** A unified and cloud-based edge computing platform allows operators to flexibly deploy network functions and support infrastructure for fixed mobile convergence (FMC), to provide unified multi-access edge computing capabilities for all the access network technologies in IMT-2020 networks. This Recommendation specifies the requirements, architecture and functions of unified multi-access edge computing for supporting FMC network.

- **ITU-T Y.3139 "Fixed mobile convergence enhancements to support IMT-2020 based software-defined wide area networking service" (under approval)**: IMT-2020 based fixed mobile convergence (FMC) is one of the main trends in the future development of telecommunication. The main purpose of FMC is to combine all access technologies, including fixed and mobile access method, to access the network without network constraints. By adopting IMT-2020 technologies, SD-WAN service is required to support IMT-2020 access as one of the multiple connection types. By having the enhancements of FMC, IMT-2020 based SD-WAN service could have some features such as end to end isolated connections and duel link transmission. This Recommendation provides specification about fixed mobile convergence enhancements to support IMT-2020 based software-defined wide area networking service.

- **ITU-T Y.3158 "Local shunting for multi-access edge computing in IMT-2020 networks" (under approval)** points out the relationship between IMT-2020 networks and MEC system, and specifies an architecture for transmitting traffic flows at the edge of IMT-2020 networks. The objective of this Recommendation is to specify the requirements, architecture, functional entities, reference points and information flows for multi-access edge computing in IMT-2020 networks.

- **ITU-T Y.3181 "Architectural framework for Machine Learning Sandbox in future networks including IMT-2020" (under approval)** provides an architectural framework for machine learning (ML) sandbox in future networks including IMT-2020. More precisely, it describes requirements and high-level architecture for ML sandbox in future networks including IMT-2020.

- **ITU-T Y.3182 "Machine learning based end-to-end multi-domain network slice management and orchestration" (under approval)** describes an intelligent cost-effective network management and orchestration framework that can cope with the

challenges of multi-domain network slicing, while minimizing human intervention towards full automation of slice lifecycle management and runtime operation. It addresses the following subjects:

- Overview and interoperability requirements of machine learning based multi-domain end-to-end network slice management and orchestration;
- Functional requirements of machine learning based multi-domain end-to-end network slice management and orchestration;
- Framework of machine learning based multi-domain end-to-end network slice management and orchestration;
- Cognitive components for the framework.

- **ITU-T Y.3200 "Information centric networking for IMT-2020 and beyond - Requirements and capabilities of data object segmentation"** starts with the introduction to data object segmentation in information centric networking (ICN) for IMT-2020 and beyond. It specifies the service and functional requirements and capabilities of data object segmentation achieve high efficiency of caching and forwarding in ICN.

- **ITU-T Y.3537 "Cloud computing – Functional requirements of cloud service partner for multi-cloud" (under approval)** provides the overview of multi-cloud and the functional requirements of cloud service partner for supporting multi-cloud by identifying various use cases related with multi-cloud in terms of cloud service customer, cloud service provider and cloud service partner. It also provides cloud computing activities to support multi-cloud as sub-role of cloud service partner by identifying interactions between cloud service customer, cloud service provider and cloud service partner.
- **ITU-T Y.3538 "Cloud computing - Global management framework of distributed cloud" (under approval)** introduces the framework and functional requirements of the global management of distributed cloud. The global management framework includes resource management, data management, platform service management, application service management, operation and maintenance management, and risk management.
- **ITU-T Y.3602 (revised) "Big data – Functional requirements for data provenance" (under approval)** describes a model and operations for big data provenance. Also, this Recommendation provides the functional requirements for big data service provider (BDSP) to manage big data provenance. The reliability of data is an important factor in determining the reliability of the analysis result. Data provenance aims to ensure the reliability of data by providing transparency of the historical path of the data. In a big data environment, complex data processing and migration due to the big data lifecycle and data distribution cause various difficulties in managing data provenance.
- **ITU-T Y.3655 "Big data driven networking - management and control mechanisms" (under approval)** specifies the management and control mechanisms of big data driven networking. The Recommendation studies general mechanisms related to management and control aspects of big data driven networking, and management mechanisms, control mechanisms, orchestration mechanisms of big data driven networking, and

other consideration related to management and control mechanisms of big data driven networking.

- **ITU-T Technical Report GSTR-5GQoE "QoE requirements for real-time multimedia services over 5G networks"** defines a scope for the analysis of QoE in 5G services and several use cases where this scope is applicable. Such use cases are: Tele-operated Driving, Wireless Content Production, Mixed Reality Offloading, and First Responder Networks. Addressing this set of use cases is challenging for three different reasons:

  - Their requirements and Quality of Experience (QoE) expectations may be different from the ones typically present in most QoE-related research and Recommendations, which typically address communication services for consumer-type users (e.g., telephony, videoconference, video delivery / streaming, gaming, etc.).

  - The experience and expectations of the use case owners may not be applicable to cellular wireless networks, even when QoS policies are applied. E.g., a wireless content production studio will not have the same channel capacity as a wired network, neither from bandwidth nor from reliability points of view. Therefore, totally new impairments or artifacts may appear when moving the use case from wired links to 5G.

  - Professional and vertical markets applications typically have less users than the video consumer market ones (there are fewer content producers than content consumers), or the video transmission is just one of the pieces of a much more complex ecosystem (as in the automotive industry).

  For each of the services, the document describes:

  - Its main characteristics and reference architecture.

  - The relevant QoE indicators to be considered on the service.

  - A reference implementation, including the order-of-magnitude values of the service Key Performance Indicators, and

  - An analysis of the key factors to evaluate the QoE of the service.

  Cloud computing, big data and data management work in ITU-T is reported as follows:

- **ITU-T X.1380 "Security guidelines for cloud-based data recorders in automotive environments"** (under approval): The purpose of this Recommendation is to standardize security guidelines for cloud-based data recorders in automotive environments. This Recommendation describes threats, vulnerabilities, security requirements, and use cases for cloud-based data recorders in automotive environments. Event data recorders are one of the most important components installed in automotive road vehicles in order to record vehicle status, vehicle movements and user inputs during crashes. Through analysing the event data, we can understand the cause of a crash and eventually use it to improve safety in automotive environments. A data storage system for automated driving is also an important component to record a set of data that will give a clear picture of the interactions between the driver and the automated driving system. However, conventional event data recorders record and manage the whole data locally, and in this way the data might come under threats of loss and destruction. Meanwhile, cloud computing is being considered an enabler of network access to a scalable and elastic pool of shareable

physical or virtual resources with self-service provisioning and administration on-demand. Industries such as the aviation industry are already attempting to apply cloud services to event data recording systems to increase safety in the aviation environment. According to the current trend of connectivity among the vehicles, the event data recorders and the data storage system for automated driving in automotive will be implemented to increase their overall safety. However, They have various vulnerabilities in the process of collecting, transferring, storing, managing, and using the recorded data according to the distinctive characteristics of the automotive environment. Therefore, it is necessary to study these vulnerabilities, security requirements, and use cases for cloud-based data recorders in automotive environments.

- **ITU-T X.1643 "Security requirements and guidelines of virtualization container in cloud computing environment"** analyses security threats and challenges on virtualization container in cloud computing environment and specifies a reference framework with security guidelines for virtualization container in cloud.

- **ITU-T X.1644 "Security guidelines for distributed cloud"** (under approval) analyses security threats and challenges on distributed cloud and propose security guidelines against threats for distributed cloud, which includes the security guidelines for core cloud, regional cloud and edge cloud.

- **ITU-T Y.3505 (revised) "Cloud computing – Overview and functional requirements for data storage federation"** provides overview and functional requirements of data storage federation. Data storage federation provides a single virtual volume from multiple data sources in heterogeneous storages. In this Recommendation, configuration for logical components, and ecosystem of data storage federation as well as cloud computing based data storage federation are introduced for data storage federation. Functional requirements are derived from use cases.

- **ITU-T Y.3528 "Cloud computing - Framework and requirements of container management in inter-cloud"** provides framework and functional requirements of container management in inter-cloud. It addresses overview, framework, functional requirements and use cases of container management in inter-cloud. The functional requirements are derived from the corresponding typical use cases.

- **ITU-T Y.3529 "Cloud computing - Data model framework for NaaS OSS virtualized network function"** specifies the data model framework for NaaS OSS network function (OSS-NF), as a functional component of NaaS functional architecture defined in Recommendation ITU-T Y.3515, in the virtualized environment. It covers both of the basic functions (non-SDN) and SDN functions of NaaS OSS-NF.

- **ITU-T Y.3535 "Cloud Computing – Functional requirements for container"** provides the overview and functional requirements of container in cloud computing. It describes the technical aspects of container and provides the relationship between containers and cloud computing. It also provides functional requirements for container in term of container engine, container management system and cloud computing to support container.

- **ITU-T Y.3536 "Cloud computing - Functional architecture for cloud service brokerage"** describes functional architecture for cloud service brokerage (CSB) based on functional requirements defined in [ITU-T Y.3506]. This Recommendation also provides the reference points among CSB functions, and the relationship between the CSB functional architecture and the cloud computing reference architecture specified in [ITU-T Y.3502].

140. ITU-T study groups developed Recommendations and other texts in the context of Action Line C6:

- **ITU-T D.608R "OTT Voice Bypass" (under approval)**: OTT voice bypass is now widely recognised as a form of traffic bypass and a growing source of losses for international inbound voice revenues. The regional Recommendation will focus on national and regional collaboration between member states and operators to deal with the OTT voice bypass issue.
- **ITU-T H.225.0 (V8) (revised) "Call signalling protocols and media stream packetization for packet-based multimedia communication systems"** covers the technical requirements for narrow-band visual telephone services defined in H.200 and F.720-series Recommendations, in those situations where the transmission path includes one or more packet-based networks, each of which is configured and managed to provide a non-guaranteed Quality of Service (QoS) which is not equivalent to that of N-ISDN, such that additional protection or recovery mechanisms beyond those mandated by ITU-T Rec. H.320 need be provided in the terminals. It is noted that ITU-T Rec. H.322 addresses the use of some other LANs which are able to provide the underlying performance not assumed by the ITU-T Recs H.323 and H.225.0. This Recommendation describes how audio, video, data, and control information on a packet-based network can be managed to provide conversational services in H.323 equipment. Products claiming compliance with Version 8 of H.225.0 (this version) shall comply with all of the mandatory requirements of this Recommendation. Version 8 products can be identified by H.225.0 messages containing a protocolIdentifier value of {itu-t (0) recommendation (0) h (8) 2250 version (0) 8}.

  This revision incorporates the following changes:

  1) Enhancements for language capability exchange
  2) Modification to the scope regarding use on the Internet
  3) Clarification that the Facility message may be used to initiate call transfer.

- **ITU-T H.245 (V17) (revised) "Control protocol for multimedia communication"** specifies syntax and semantics of terminal information messages as well as procedures to use them for in-band negotiation at the start of or during communication. The messages cover receiving and transmitting capabilities as well as mode preference from the receiving end, logical channel signalling, and Control & Indication. Acknowledged signalling procedures are specified to ensure reliable audiovisual and data communication. Products claiming compliance with Version 17 of ITU T H.245 shall comply with all of the mandatory requirements of this Recommendation. Version 17 products can be identified by ITU T H.245 TerminalCapabilitySet messages containing a protocolIdentifier value of {ITU T (0) recommendation (0) h (8) 245 version (0) 17}.

Relative to ITU T H.245 Version 16 (2011), this version incorporates the following changes:

– Add procedures in Annex V to support better interoperability between IPv4 and IPv6 devices

– Updated Table VIII.1 to support the revisions made to H.241

– Support of an SCTP media transport in H.323 systems, including the addition of Annex U

– Support of DTLS media transport in H.323 systems, including the addition of Annex U

– Support of out of band data channel establishment for Annex U

– Propose updates to H.245 to support SCTP: split dtls-sctp into udp-dtls-sctp and tcp-dtls-sctp

– Add ExtendedAudioCapability and ExtendedDataCapability in H.245.

- **ITU-T H.323 (V8) (revised) "Packet-based multimedia communications systems"** describes terminals and other entities that provide multimedia communications services over Packet-Based Networks (PBN) which may not provide a guaranteed Quality of Service. H.323 entities may provide real-time audio, video and/or data communications. Support for audio is mandatory, while data and video are optional, but if supported, the ability to use a specified common mode of operation is required, so that all terminals supporting that media type can interwork.

  The packet-based network over which H.323 entities communicate may be a point-to-point connection, a single network segment, or an internetwork having multiple segments with complex topologies.

  H.323 entities may be used in point-to-point, multipoint, or broadcast (as described in Rec. ITU T H.332) configurations. They may interwork with H.310 terminals on B-ISDN, H.320 terminals on N-ISDN, H.321 terminals on B-ISDN, H.322 terminals on Guaranteed Quality of Service LANs, H.324 terminals on GSTN and wireless networks, V.70 terminals on GSTN, and voice terminals on GSTN or ISDN through the use of Gateways.

  H.323 entities may be integrated into personal computers or implemented in stand-alone devices such as videotelephones.

  Products claiming compliance with Version 8 of H.323 shall comply with all of the mandatory requirements of this Recommendation, H.323 (2022), which references Rec. ITU T H.225.0 (2022) and Rec. ITU T H.245 (2022 or later). Version 8 products shall be identified by H.225.0 messages containing a protocolIdentifier = {itu t(0) recommendation(0) h(8) 2250 version(0) 8} and H.245 messages containing a protocolIdentifier = {itu-t(0) recommendation(0) h(8) 245 version(0) x}, where "x" is 16 or higher. In addition to many minor corrections and clarifications, this version of Rec. ITU T H.323 incorporates enhancements and clarifications to Annex O and to Annex M5 to support ITU-T X1303 bis.

- **ITU-T H.721 (V3) (revised) "IPTV terminal devices: Basic model"** describes and specifies the functionalities of the Internet protocol television (IPTV) terminal devices for the

IPTV basic services defined in Recommendation ITU-T H.720. This Recommendation is targeted at IPTV terminal devices capable of receiving linear television (TV) service and video-on-demand services, with additional data content (such as text) using a managed content delivery network. The service definition takes into consideration conditions on content delivery such as quality of service (QoS). The expected types of IPTV terminal devices are set-top boxes and digital TV sets with embedded IPTV capabilities. The second edition introduced support for high efficiency video coding (HEVC), dynamic adaptive streaming over HTTP (DASH), MPEG-4 audio lossless coding (ALS), MPEG-4 advanced audio coding (AAC), DTS-HD, timed text markup language (TTML), MPEG media transport (MMT) and several corrections and clarifications. The third edition introduces support for new technologies such as timestamped fragmented TLV (TFT).

- **ITU-T J.299 (revised) "Functional requirements for remote management of cable STB by auto configuration server"** defines the functional requirements for the interface between auto configuration server (ACS) at the cable headend or other cable operator locations and cable set-top box (STB) to remotely set up and maintain the STB and collect data from the STB. In addition, a function to enable network address translation (NAT) traversal and means to securely handle the collected data are also considered.

- **ITU-T J.483 "Architecture and Functional Specifications of a radio frequency (RF)/Internet protocol (IP) video switching system"** defines the Architecture and Functional Specifications of a radio frequency (RF)/Internet protocol (I/IP) video switching system. This Recommendation document is Part 2 of a multi-part deliverable covering both the Requirements [ITU-T J.482] as well as the Architecture and Functional Specifications for RF/IP switching system, as identified below:

  Part 1: Requirements [ITU-T J.482];

  Part 2: Architecture and functional specifications;

  Cable television operators provide subscribers with a variety of video services composed of RF-signal-based video (RF-video) and IP-signal-based video (IP-video) over cable networks. While the bandwidth is limited, cable operators are facing subscriber needs to watch higher quality video such as 4K in either RF or IP format. Under these circumstances, the purpose of RF/IP switching system is to create an environment where almost all the subscribers can watch 4K videos if they so wish.

- **ITU-T J.1111 "Requirements for advanced IP-based digital video convergence service"**: As digital broadcasting services have been rapidly deployed, many service operators are considering more effective transmission of digital broadcasting services. Recently, the digital broadcasting services have been changed to use resources efficiently and transmits them to easily accommodate the consideration varying needs and environments of subscribers. Therefore, it is necessary to redefine the advanced IP-based digital video convergence service for maintaining QoS (Quality of Service) and using bandwidth effectively transmission on broadband network environment. The switched digital video (SDV) service is a service mechanism for distributing digital video via RF-based broadband networks, while the IP-based SDV Service is a service mechanism for distributing digital video via IP-based broadband networks. The advanced IP-based digital video convergence service is the service mechanism for providing interfaces and functionalities to enable the service operators to offer quality of service (QoS)-guaranteed broadcasting to subscribers via IP-based converged

broadband networks. This Recommendation aims to define the service requirements of IP-based digital video convergence service including IP-based SDV technologies considering the convergence environment. ITU-T J.1111 references normatively the ITU-T J.1101 (i.e. functional requirement for the IP-based switched digital video service).

- **ITU-T J.1303 "The specification of cloud-based converged media service to support IP and Broadcast Cable TV - System specification on collaboration between production media cloud and cable service cloud"** is Part 3 of a multi-part deliverable covering the high-level system architecture for cloud-based converged media service to support IP and Broadcast Cable TV, as identified below:

  Part 1: Requirements;

  Part 2: System architecture

  Part 3: System specification on collaboration between production media cloud and cable service cloud.

- **ITU-T J.1304 "Functional requirements for service collaboration between cable television operator and OTT service provider"** defines functional requirements for a cable television operator to provide an OTT service to cable television customers in conjunction with their cable television services, VOD service, high-speed cable internet and so on by collaboration with an OTT service provider. As a reference architecture, the system architecture and interfaces between a cable television operator and one or more OTT service provider(s) are specified. To exemplify collaboration patterns of a cable television operator with an OTT provider, this Recommendation also describes the configuration patterns of relevant entities including a user, a cable television operator and one or more OTT service provider(s).

- **ITU-T J.1401 "Television Content Distribution Platforms: Requirements for Open Access and Signal Quality"**: In a country where analogue TV to digital TV (DTT) migration is taking place, the use of fibre optic backbone and local loop is considered as affordable and reliable for content delivery. When such digital television content distribution platforms are provided by single signal distribution provider and National Fibre Optic Infrastructure provider, it is imperative that they are open for access by any entity providing DTT and other television content on an equal basis. This Recommendation defines technical requirements for digital television content distribution platforms that consist of national fibre optic lines and local loops that provide Open Access to entities who wish to deliver content to end users, as well as expected signal quality.

- **ITU-T J.1612 "The Architecture for Smart Home Gateway"**: Smart home is a kind of home automation system in which a wide range of IoT devices in a home cooperate to provide intelligent controlling and monitoring functions for home users. Smart home gateway connects various smart home devices, provides hardware interfaces of various smart home communication protocols, runs communication protocols, performs protocol conversion and bridging, realizes the interaction between user control terminal and Cloud server. This Recommendation aims to define the architecture for the smart home gateway (SHGW) which addresses the functional requirements found in [ITU-T J.1611]. The Recommendation consists of concepts of virtual device model, dynamic device profile and other important software modules. With introduction of

these important modules, the architecture can dynamically support existing smart home devices and the devices in future.

- ITU-T Q.3061 "Signalling requirements for service function paths load balancing traceroute in service function chaining" specifies the signalling requirements for service function paths (SFPs) load balancing traceroute in service function chaining (SFC). The signalling is used for tracing and figuring out the set of load balanced SFPs more efficiently.
- **ITU-T Q.3406 "Signalling requirements for telemetry of virtual broadband network services" (under approval)** specifies the signalling requirements for telemetry of virtual broadband network services, by architecturally adding the dedicated functional component and the corresponding interfaces in NFV framework.
- ITU-T Q.3631 "Interworking between ISDN and the IP Multimedia (IM) Core Network (CN) subsystem" specifies the requirements for providing the interworking between ISDN and the IP Multimedia (IM) Core Network (CN) subsystem. This Recommendation endorses ETSI TS 183 036 (2021-02) "Core Network and Interoperability Testing (INT); ISDN/SIP interworking; Protocol specification".
- ITU-T Q.3646 "Framework and protocols for signalling network analyses and optimization in VoLTE": Signalling network includes the network entities and the signalling exchange which are related to telecommunications services. Analyses and optimization on signalling network are important methods for network and service-related management and operation. This Recommendation specifies the framework, interfaces, protocols, service procedures, AI/ML-assisted functions, and security considerations of signalling network analyses and optimization in the context of VoLTE network.
- **ITU-T Q.3721 "Procedures for Programming Protocol-Independent Packet Processors (p4) Switch-based vBNG" (under approval)** specifies the architecture, interfaces, and procedures for Programming Protocol-Independent Packet Processors (p4) Switch-based vBNG.
- ITU-T Q.5003 "Signalling requirement and architecture for federated multi-access edge computing": MEC is considered as a key successful factor in 5G era that can provide low latency user experience and huge data volume. Latency sensitive services are expected to have benefits from being hosted in the distributed cloud close to mobile network users. MEC services are typically envisaged as being offered and supplied by mobile network operators. These MEC systems have developing separately and become difference verticals, which will significantly increase the complexity for application providers in extending the reach of applications. To resolve this limitation, MEC providers need to adopt a federation model to interconnect each separated MECs with unified interfaces. As the federated members share their network and resource capabilities and secure interfaces between their systems, the total MEC coverage can be extended and consistent service delivery can be guaranteed. Thus, this Recommendation ITU-T Q.5003 specifies signalling requirements and architecture for federated MEC.
- ITU-T Y Suppl.60 (revised) "Interpreting Y.1540 Maximum IP-Layer Capacity Measurements" to the ITU-T Y-series Recommendations provides information on

interpreting ITU-T Y.1540 maximum IP-layer capacity measurements as described in Annex A and Annex B of the Recommendation. This Supplement also provides useful information for those who measure various technologies. Much has been learned as part of extensive testing campaigns thus far, and there is more to learn. Therefore, this Supplement may be updated frequently, and readers are encouraged to ensure that they are using the most recent version.

141. Internet of Things (IoT) standardization progressed and numerous ITU-T Recommendations and other texts were developed:

- **ITU-T X.1352 "Security Requirements for Internet of things (IoT) device and gateway"** (under publication) establishes detailed requirements for five security dimensions applicable to Internet of things (IoT) device and gateway: authentication, cryptography, data security, device platform security, and physical security, based on the IoT reference model specified in [ITU-T Y.4100] and the IoT security framework in [ITU-T X.1361]. The authentication dimension includes user authentication, secure use of authentication credentials and device authentication. The cryptography dimension includes the use of secure cryptography, secure key management and secure random number generation. The data security dimension includes secure transmission and storage, information flow control, secure session management and personally identifiable information (PII) management. The device platform security dimension includes five elements: software security; secure update; security management; logging; and timestamp. Likewise, the physical security dimension includes a secure physical interface and tamper-proofing.
- **ITU-T X.1353 "Security methodology for zero-touch deployment in massive IoT based on blockchain"** (under approval): Massive Internet of Things (mIoT) is a significant application of future communication networks. With diverse use cases anticipated in mIoT, it is difficult for manufactures to pre-install their manufactured IoT devices with mobile-operator-specific and/or the service-specific information (e.g., identities and keys), since manufactures may not know where their devices will eventually be deployed and activated. The current approach relies on customers' manual configuration. This is acceptable for small-scale IoT applications. However, for mIoT devices, the aforementioned approach is unacceptable due to the fact that manual configuration is time consuming, cost-ineffective and cumbersome. Thus, automatic credential provisioning without user involvement, known as "zero-touch" is needed for mIoT. This Recommendation provides a security methodology on designing such a decentralized identity management system to support the zero-touch deployment of future mIoT. Zero-touch deployment will enable IoT devices to automatically find their mobile network operator and their service provider, automatically obtain credentials from them and automatically connect to the network and the service. This will greatly facilitate the future deployment of mIoT devices for verticals. The content of this Recommendation will cover the security architecture, the security considerations and the related security procedures (such as device attestations, authentication, and credential provisioning) which are needed for building such a zero-touch mIoT deployment platform.
- **ITU-T X.1369 "Security requirements for IoT service platform"** specifies security requirements for IoT service platform. It assesses security threats and challenges to IoT

business service platform and describes security measures that could mitigate security threats and challenges.

- ITU-T Y.4052 "Vocabulary for blockchain for supporting Internet of things and smart cities and communities in data processing and management aspects" contains blockchain-related vocabulary to be used for Internet of things (IoT) and smart cities and communities (SC&C) in aspects of data processing and management (DPM). The vocabulary in this Recommendation is collected from the Recommendations, Supplements and standards published by ITU and ISO. In addition, this Recommendation includes and defines new terms to meet the needs of SC&C work within ITU.
- ITU-T Y.4123 "Requirements and capability framework of smart shopping mall system": By deploying IoT devices, smart shopping malls make use of IoT technologies to collect data, control device remotely, monitor the environment, etc. These IoT technologies can enable intelligent services such as intelligent device collaboration, indoor navigation, asset tracking etc., which can help to improve management efficiency, resulting in enhanced consumer experience and more businesses opportunities. This Recommendation specifies requirements and capability framework of smart shopping mall system.
- ITU-T Y.4214 "Requirements of IoT-based civil engineering infrastructure health monitoring system": Monitoring the safety and integrity of civil engineering infrastructures using objective data collected from the infrastructures themselves with Internet of things (IoT) capabilities is an effective means to supplement inspection and diagnosis for advanced and efficient maintenance work on civil engineering infrastructures. In this Recommendation, an IoT-based system for this purpose is called a civil engineering infrastructure health monitoring system. This Recommendation describes the requirements specific to the IoT-based civil engineering infrastructure health monitoring system for the purpose of maintaining civil engineering infrastructures.
- ITU-T Y.4215 "Use cases, requirements and capabilities of unmanned aircraft systems for the Internet of Things" describes the use cases, requirements and capabilities of unmanned aircraft systems (UASs) for the Internet of things (IoT). According to different wireless communication scenarios, the use cases are classified in four categories: UAS-aided offloading, UAS-aided emergency response, UAS-aided relaying and UAS-aided information dissemination and data collection. Common and specific requirements and capabilities of UASs for IoT support of the different use cases are described in this Recommendation.
- ITU-T Y.4216 "Requirements of sensing and data collection system for city infrastructure" provides the concept and classification of basic city infrastructures. The sensing and data collection system of city infrastructure is also described. A lot of city infrastructures are taken into consideration in building smart cities such as energy, transportation, healthcare, cultural, sports and educational infrastructures. This Recommendation identifies these infrastructures and provides the functions and requirements of sensing and data collection system for those city infrastructures. The sensing and data collection system provides unified management to the sensing devices attached to various city infrastructures. This Recommendation is helpful for the cities

to build smart city by improving the efficiency and resilience of city infrastructure through using ICT.

- **ITU-T Y.4217 "Service requirements and capability framework for IoT-related crowdsourced systems":** Service requirements and capability framework for IoT-related crowdsourced systems can help the implementation of IoT-related crowdsourced systems. This Recommendation specifies service requirements of IoT-related crowdsourced systems, in addition to the requirements of IoT-related crowdsourced system [ITU-T Y.4205] and the common requirements of IoT [ITU-T Y.4100]. Based on these requirements, a capability framework of IoT-related crowdsourced systems is developed.
- **ITU-T Y.4481 "Framework for data middle-platform in IoT and smart sustainable cities"**: A data middle-platform (DM) is expected to provide innovative digital data services to deliver data value. It allows separation of the fundamental technical supporting capabilities from the business-related services. The main purpose of a DM is to aggregate and manage cross-domain data into services. For Internet of things (IoT) and smart sustainable cities (SSC), a DM aims at providing common data services that can be reused in diverse application domains by governments, enterprises, organizations and individuals.
- **ITU-T Y.4482 "Requirements and framework for smart livestock farming based on the Internet of things"**: Smart livestock farming (SLF) is a convergence service where Information and Communication Technologies (ICT) are applied into the livestock value chains. It has the potential to deliver a more productive and sustainable production by integrating processes of the smart farming, Management Information Systems (MIS), stockbreeding automation and robotics to provide a better decision making or more effective exploitation operations and management of livestock value chains. The use of Internet of Things (IoT) technologies in the SLF aims at providing a full coverage of the processes by collecting and transmitting data from the entire agroecosystem. That means SLF can establish contact with each participant of a livestock chain, bringing and collecting information about their processes, increasing the possibilities for control and improvement on the efficiency of their tasks. This Recommendation provides an overview of SLF based on IoT, high-level requirements for SLF, as well as a reference model which represents a generic sequence for the livestock value chains and is applicable to these chains as a whole, regardless of species or rearing techniques.
- **ITU-T Y.4483 "Reference architecture of service exposure for decentralized services for Internet of things applications"** introduces a service exposure for decentralized services (DSE) for Internet of things (IoT) applications and specifies its common characteristics, general requirements, reference architecture and common capabilities. A DSE is a functional entity for IoT applications in an IoT device, which integrates multiple decentralized services (such as services based on distributed ledger technologies) and exposes uniform interfaces to IoT applications. Those integrated decentralized services may support the same or different types of decentralization solutions. IoT applications can use uniform interfaces to integrate and access multiple decentralized services at the same time, regardless of their decentralization solutions. A DSE can bring efficiencies and benefits to application providers and users.

- **ITU-T Y.4484 "Framework to support Web of Objects ontology based semantic data interoperability of eHealth services"** specifies the framework to support Web of Objects (WoO) ontology based semantic data interoperability of eHealth services in accordance with [ITU-T Y.4452] and [ITU-T Y.4563]. A semantic data interoperability enables the various eHealth systems to combine received information with other information resources and to process it in a manner that preserves meaning. In order to support the semantic data interoperability functions among eHealth systems, this draft Recommendation applies the WoO framework in [ITU-T Y.4452] and the semantic data interoperability function in [ITU-T Y.4563].
- **ITU-T Y.4500.3 "oneM2M - Security solutions" (under approval)** provides specifications for M2M security and privacy protection.
- **ITU-T Y.4600 "Requirements and capabilities of a digital twin system for smart cities":** A digital twin is a digital representation of an object of interest and may require different capabilities according to the specific domain of application, such as synchronization between a physical thing and its digital representation, and real-time support. A smart city digital twin can be defined as a digital twin for a smart city that can be used to develop strategies to achieve specific goals for a smart city, by conducting simulations and to increase visibility of human-infrastructure-strategy interactions. A smart city digital twin allows the simulation of plans before implementing them, exposing problems before they become a reality. In other word, it is possible to conduct simulations on a digital replica of the city (virtual cities) before actually implementing the strategy on the real city. In this way, it is also possible to find the best strategies to achieve a specific goal or strategies that have similar effects while minimizing budget and resource usage. Therefore, a smart city digital twin is a tool for improving urban operations, efficiencies and resilience of a city.
- **ITU-T Y.4601 "Requirements and capability framework of digital twin for smart firefighting" (under approval)**: A digital twin is a digital representation of an object of interest, and may require different capabilities according to the specific domain of application such as synchronization between a physical thing and its digital representation, and real-time support [ITU-T Y.4600]. Through the IoT technology deployment and the information integration process, a digital twin can provide high fidelity digital representation of the fire scene, enable dynamic convergence between the physical entity and digital entity, and achieve comprehensive understanding and control of the past, present, and future of the fire scene. The current state of the art for firefighting lacks comprehensive dynamic sensing capability and prediction capability, it cannot provide delayed information, and adequate visibility of the interaction between personnel and fire scene. Through the deployment of gateways, sensors, high quality network, multi-physics simulation, dynamic analysis and prediction, 3D visualizations. The smart firefighting digital twin enables intelligent services such as personnel tracking, hazard tracking, fire scene dynamic analysis, rescue strategy optimization, pre-simulation, historical scene reconstruction, etc., these intelligent services can help to improve decision-making processes and reduce the casualties. This Recommendation specifies the requirements and capability framework of digital twin for smart firefighting.

- **ITU-T Y.4903 (revised) "Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals"** provides key performance indicators (KPIs) for smart sustainable cities (SSCs) and general principles for selecting KPIs to help cities achieve sustainable development goals (SDGs). This Recommendation provides a means to benchmarking and disseminating best practices in utilizing ICTs and other technologies to enhance cities' sustainability and connect their smart strategies to the SDGs through an inclusive process. These KPIs are designed to evaluate the role and performance of Information Communication Technologies (ICTs) in the three dimensions of a city: Economics, Environment, and Society and Culture. The indicators are uniquely coordinated to allow cities to measure their progress on reaching the ambitious targets set by the SDGs.

ITU-T Study Group 20 adopted the IoT specifications from OneM2M and published them as Recommendations. Draft Recommendation ITU-T Y.4500.3 (ex Y.oneM2M.SEC.SOL) "oneM2M - Security Solutions" is currently under approval. ITU-T Study Group 20 is working on transposing the technical specifications from TMForum as follows: draft Recommendation ITU-T Y.TM.DM-API "IoT Device Management API REST Specification" and ITU-T Y.TM.SM-API "IoT Service Management API REST Specification".

142. An ITU-T Global Portal on Environment and Smart Sustainable Cities highlights the latest external resources related to six distinct topics, including; smart sustainable cities; cities' actions to tackle Covid-19; energy efficient ICTs; climate change; e-waste management and circular economy; and frontier technologies (e.g. AI, IoT, blockchain).

143. A Toolkit on Digital Transformation for People-Oriented Cities and Communities has been developed to support cities and communities. The resources contained in this Toolkit include international standards and guidance, the latest research and projections, and cutting-edge reports on a variety of timely topics relevant to the digital transformation of cities and communities.

144. An ITU-T Global Portal is maintained with special focus on activities in the Africa, Asia Pacific, Arab, and Americas regions.

145. ITU-T's work on accessibility has started early 1990s with ITU-T V.18 text telephone. Since then, ITU-T SG16 has developed a number of ITU-T standards on accessibility, within Question 26/16 on accessibility and Question 24/16 on human factors, **cooperating with advocacy organizations** (such as the G3ict, WFD) in addition to other technical groups, and **with participation of persons with disabilities**. Accessibility and Standardization shows examples of ITU-T work.

    In addition, as accessibility is a cross-cutting subject through various ICT technologies, **multiple ITU-T Study Groups**, including, ITU-T SG2 (Operational aspects), SG9 (Broadband cable and TV) and SG20 (IoT, smart cities & communities) have Work Items related to accessibility.
    In addition to Study Groups, the following groups also work on accessibility:
    - ITU-T Joint Coordination Activity on Accessibility and Human Factors (JCA-AHF): **coordination** group on activities concerning accessibility;

- ITU Intersector Rapporteur Group Audiovisual Media Accessibility (IRG-AVA): **joint group** of ITU-R SG6, ITU-T SG9 and SG16 working on standardization on accessibility of audiovisual media considering a number of delivery systems.

A sample of recently developed standards includes:
ITU-T F.780.2 "Accessibility of telehealth services", defines accessibility requirements for technical features to be used and implemented by governments, healthcare providers and manufacturers of telehealth platforms to facilitate the access and use of telehealth services by persons with disabilities and specific needs. During the current Covid-19 pandemic, the use of telehealth services has increased substantially in many countries and telehealth has become a basic need for the general population, but many persons with disabilities experience difficulties accessing and using such services and are often forgotten.

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146. Additional details about other activities implemented by BDT in all ITU regions can be found in BDT's quarterly and annual performance reports: <https://www.itu.int/en/ITU-D/Pages/OperationalPlansPerformanceReports.aspx>.

(c) Co-facilitator of Action Lines C1, C3, C4, C7, C11 and Partners for C8 and C9.

Action Line C1: The Role of Public Governance Authorities and all Stakeholders in the Promotion of ICTs for Development

Related to SDGs: SDG 1, SDG 3 (3.8, 3.d), SDG 5, SDG 10 (10.c), SDG 16 (16.5, 16.6, 16.10), SDG 17 (17.18)

147. In accordance with its mandate, the ITU continues to foster international and regional cooperation on a broad range of activities. ITU conducted several meetings, conferences and symposiums to provide a platform to broaden international dialogue on innovative means in harnessing ICTs for advancing development. In 2022, ITU organized a number of events. Series of regional meetings on private-public partnerships as a solution to address the needs of regions for digital technology deployment were organized. At the occasion of the WSIS 2022, several meetings were organized for various Action Lines offering platforms for discussion, networking and collaboration for stakeholders on projects and initiatives to promote of ICTs for Development. The 17th Action Line Facilitation Meeting of C1, C7:E-Government and C11 was held on Monday, 30 May 2022 on the topic of "Creating synergies and partnerships on e-government between national and local levels". The main objective of the session was to find avenues to help cities in their digital transformation process. It is noted that the cities are behind national governments when it comes to e-government development. In this regard, the session focused on the role of government and other stakeholders in promoting the use of ICTs for development as well as international and

regional cooperation. In particular, the session highlighted e-government initiatives at national and local levels and how to create synergies and partnerships between the two. After an overview of the global e-government situation by the Digital Government Branch including the situation in cities, national governments, city officials, and UN agencies shared their experiences in aligning national and local e-government initiatives.

148. Overall outcomes of the session highlighting

- National and local governments need to strengthen their collaboration and interoperability to transform challenges highlighted today with opportunities.
- International cooperation, regional collaboration, public-private partnership, etc. are key to ensuring smooth digital transformation.
- By joining the LOSI network, cities could learn and adapt from other cities' best practices, exchange opinions on how to deal with common challenges, and benefit from international organizations' expertise and support.

149. The WSIS Prizes 2022 Winner for the Action Line C1 is Meghalaya Enterprise Architecture Implementation, India. Details of the project are available here.

150. The ITU has been contributing greatly to WSIS implementation and follow-up since its inception to the present. In 2022, ITU, in close partnership with other United Nations agencies and all WSIS stakeholders, has been leading numerous activities worldwide in the field of information and communication technologies for development, these activities are reflected throughout the report. This section will present major and the most significant initiatives fostered by ITU in 2022.

151. ITU Telecom organizes an annual global tech event for governments, industry and SMEs to exhibit innovative solutions, network, share knowledge and use the power of technology to accelerate economic development and social good for all. ITU Virtual Digital World 2020 took place online from 20 -22 October 2020, bringing together ministers, regulators and tech experts to showcase and debate the role of digital technologies and public-private sector collaboration in the COVID-19 era. The event comprised Ministerial roundtables, Forum webinar sessions and a virtual Exhibition enabling online showcasing. The ITU Digital World 2020 Virtual SME Awards and Masterclasses offered SMEs worldwide the opportunity to apply with their innovative solutions in range of different sectors**. ITU Digital World 2021** takes place from 01 September - 01 December, comprising Forum Webinars, Ministerial Roundtables (12-15 October), SME Programme and culminating in the event's annual ITU Digital World 2021 SME Awards. It also marks the 50th anniversary of the first ITU Telecom event in 1971. Co-hosted- as in 2020- with the Government of Viet Nam, it brings together leaders of government and industry under a timely theme: "Building the digital world. Together." Read the highlights here.

152. Advisory **Groups for each Sector: Advisory Groups for each Sector meet every year and** review priorities, strategies, operations and financial matters of the Sector. Please see the Advisory Groups for the sectors below:

- The Telecommunication Development Advisory Group (TDAG) for the ITU-D. In 2020, TDAG was held virtually from 2 to 5 June. Please see https://www.itu.int/en/ITU-D/Conferences/TDAG/Pages/default.aspx.

- Telecommunication Standardization Advisory Group (TSAG) for the ITU-T. The first meeting of the TSAG will be held at ITU headquarters, Geneva from 12 to 16 December 2022. TSAG enters the 2022-2024 study period with a strong mandate to prepare restructuring of ITU-T study groups. The leaders of ITU's standardization expert groups (ITU T study groups) are invited to play a central role in this work, highlighting the basis of the future ITU-T study group strategy.

- Radiocommunication Advisory Group (RAG) for the ITU-R. The 29th RAG meeting was held from 11 to 14 April 2022. The 30th RAG meeting will be held on 1-4 May 2023 in Geneva, Switzerland. Please see https://www.itu.int/en/ITU-R/conferences/rag/Pages/default.aspx.

153. Study Groups for each sector:

- Standardization work is carried out by the technical Study Groups (SGs) in which representatives of the ITU-T membership develop Recommendations (standards) for the various fields of international telecommunications.

- ITU-D Study Groups provide an opportunity for all Member States and Sector Members (including Associates and Academia) to share experiences, present ideas, exchange views, and achieve consensus on strategies to address ICT priorities. ITU-D Study Groups are responsible for developing **Reports**, **Guidelines**, **Best Practices** and **Recommendations** based on input received from the membership. Information is gathered through contributions, case studies and surveys and is made available for easy access by the membership using content management and web publication tools. The Study Groups examine specific task-oriented telecommunication/ICT questions of priority to countries, especially developing countries, to support them in achieving their development goals and SDG targets.

- Outputs agreed on in the ITU-D Study Groups, and related reference material, are used as guidance for the implementation of policies, strategies, projects, and specific telecommunication/ICT initiatives in membership. These activities also serve to strengthen the **shared knowledge base** of the membership. Sharing of topics of common interest is carried out through face-to-face meetings, multilingual remote participation and online collaborative sites, in an atmosphere that encourages **open debate** and **exchange of information** and for receiving input from experts on the topics under study.

- ITU-D Study Group 1 scope focuses on "Enabling environment for the development of telecommunications/ICTs" while the work of ITU–D Study Group 2 relates to "ICT services and applications for the promotion of sustainable development".

- 9 webinars were also organized by the ITU-D Study Groups from 27 May to 29 July 2020, which shared analyses of the response to the global COVID-19 pandemic from the perspective of specific ITU-D Study Group Questions. The areas covered by the

webinars were related to several WSIS Action Lines. The detailed programmes can be found in the following link: www.itu.int/go/COVID19-dialogues. A full list of workshops and events held by ITU-D Study Groups during the 2018-2021 study period can be found in the following link.

- The ITU-R Study Groups develop the technical bases for decisions taken at World Radiocommunication Conferences and develop global standards (Recommendations), Reports and Handbooks on radiocommunication matters. More than 5 000 specialists, from administrations, the telecommunications industry as a whole and academic organizations throughout the world, participate in the work of the Study Groups on topics such as efficient management and use of the spectrum/orbit resource, radio systems characteristics and performance, spectrum monitoring and emergency radiocommunications for public protection and disaster relief (please see https://www.itu.int/en/ITU-R/study-groups/Pages/default.aspx).

154. **World Telecommunication Development Conferences**

- The World Telecommunication Development Conference (WTDC) sets the agenda and guidelines for the ITU-D Sector for the following four-year cycle, while Regional Conferences review "work-in-progress" towards the overall objectives and ensure that goals are met. The Telecommunication Development Conferences serve as forums for the discussion of the digital divide, telecommunications and development by all stakeholders involved in and concerned with ITU-D's work. In addition, they review the numerous programmes and projects of the Sector and Telecommunication Development Bureau (BDT). Results are reported and new projects are launched. Each Regional Preparatory Meeting brings together the countries in its region to explore and discuss their needs and the present and future projects of the Sector.
- The *World Telecommunication Development Conference* (*WTDC*) is an international event organized every 4 years by the ITU.
- The ITU World Telecommunication Development Conference WTDC-22 was held in Kigali, Rwanda, from 6 to 16 June 2022. Under the theme “Connecting the unconnected to achieve sustainable development”, WTDC is a unique opportunity to develop innovative approaches and new models of collaboration for connectivity and digital solutions in this final Decade of Action to achieve the SDGs. For additional information please see:
  https://www.itu.int/en/ITU-D/Conferences/WTDC/WTDC21/Pages/default.aspx
  - **ITU-D Study Groups** provide an opportunity for the membership to share experiences, present ideas, exchange views, and achieve consensus on appropriate strategies to address telecommunication/ICT priorities. The Study Groups examine specific topics of importance to developing countries to support them achieving the United Nations Sustainable Development Goals (SDG), targets and their specific development priorities.**ITU-D Study Groups 1 and 2: Questions Under Study and their linkages with SDGs and WSIS Action Lines**

Action Line C3: Access to Information and Knowledge

Related to SDGs: SDG 1, SDG 2, SDG 3, SDG 4, SDG 5, SDG 6, SDG 7, SDG 8, SDG 9, SDG 10, SDG 11, SDG 12, SDG 13, SDG 14, SDG 15, SDG 16, SDG 17

155. In 2022, ITU held numerous webinars, conferences, events, to promote digital inclusion. See details here: https://www.itu.int/en/ITU-D/Digital-Inclusion/Pages/Digital-Inclusion-Events.aspx

156. UNESCO organised the WSIS Action Line Facilitation Meeting C3, which took place at the ITU Headquarters in Geneva, Switzerland with remote participation on 30 May 2022 on the topic of "Mainstreaming Gender Equality in Digital Transformation Policies through Capacity Building". The workshop built on the findings of UNESCO reports on "The Effects of AI on the Working Lives of Women" and "Multistakeholder AI Development: 10 building blocks for inclusive policy design". It aimed at fostering important conversations about the impacts of the increasing use of advanced technology on women's equality and how to equip policy makers with the necessary tools to promote gender equality at the national level. For more details on the sessions and the outcomes, please see here.

157. ITU continues to ensuring inclusive, equal access and use of ICTs for all by supporting: (i) Member States, sector members and academia in the formulation and implementation of policies and strategies on digital inclusion, as well as awareness raising and advocacy, sharing good practices and knowledge, building capacity and the development products/services; and (ii) specific local communities (children, youth, older persons, women, persons with disabilities and indigenous people) through multi-stakeholder partnerships, collaborations and initiatives, to implement scalable roadmaps, actions, activities, and projects, to reduce the digital divide and towards more inclusive, equal access and use of ICTs for all.

158. ITU activities and resources on ICT Accessibility aim to contribute to ITU members' efforts to accelerate the implementation of digital accessibility as a means to enable digital inclusion and ensures inclusive communication for all people – regardless of their gender, age, ability or location.

159. These resources and tools include policy guidelines, toolkits, trainings (on-line/ face to face) ICT accessibility (in country) educational programmes, video tutorials; and in-country and regional assessments. Specific resources on COVID19 response and recovery were also developed. These resources were designed, developed, and made available in several UN languages to support ITU members in the regional and global implementation of ICT accessibility. Online trainings are delivered through the ITU Academy free of charge and self-paced, with localized content and the possibility of certification.

160. All ITU-D resources on ICT accessibility are delivered in accessible formats to ensure that persons with disabilities can also benefit. Examples of these resources are:

161. The ITU toolkit "Towards building inclusive digital communities," and interactive self-assessment for ICT accessibility implementation (2021);

162. Self Paced online training courses such as: ICT Accessibility: the key to inclusive communication (currently available in: Arabic, English, French, Russian and Spanish), and Web Accessibility - the Cornerstone of an Inclusive Digital Society (currently available in: Arabic, English, French, Russian and Spanish). These training courses are available through ITU Academy, free of charge and provided in digitally accessible format (they can also be followed by persons with disabilities). If the knowledge acquired is successfully validated, the training courses offer ITU certification.

163. ITU video-tutorial on the development of an in-country self-assessment (ITU toolkit, 2021);

164. Video-tutorial on: ICT Accessibility: the key to achieving a digitally inclusive world (2021);

165. ITU Report on the Information and Communication Technology (ICT) Accessibility Policy Review of the Republic of Serbia (2021);

166. ITU regional assessment on ICT accessibility for the Africa Region (2021);

167. ICT accessibility assessment report for the Europe region (2021);

168. ITU guidelines on how to ensure that digital information, services and products are accessible by all people, including persons with disabilities during COVID-19 (2020, in Arabic, Chinese, English, French, Spanish, Russian). These guidelines were selected and translated by the UN COVID-19 emergency group into the 22 most spoken languages in the world;

169. ITU regional assessment on ICT Accessibility for the Asia-Pacific region (2020);

170. On-line self-paced training on: How to ensure inclusive digital communication during crises and emergency situations (2020, in English, French, Spanish);

171. Video- tutorial on: How to ensure inclusive digital communication during crisis and emergency situation (2020, in English, French, Spanish);

172. Updated and localized On-line self-paced training on ICT Accessibility: The key to inclusive communication (2020, in Arabic, English, French, Russian and Spanish);

173. For more information on the work and resources on ICT Accessibility see here: https://www.itu.int/en/ITU-D/Digital-Inclusion/Pages/ICT-digital-accessibility/default.aspx

174. The WSIS Prizes 2022 Winner for the Action Line C3 is **Targeted poverty alleviation management based on GIS and location big data analysis**, China. Details of the project are available here.

175. ITU developed and is maintaining a database for following the transition from analogue to digital terrestrial television broadcasting:

http://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Pages/DSO/Default.aspx

176. The **World Radiocommunication Conferences (WRC)** are held every three to four years. It is the job of WRC to review, and, if necessary, revise the Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits. Revisions are made on the basis of an agenda determined by the ITU Council, which takes into account recommendations made by previous world Radiocommunication conferences. The Radio Regulations edition following the decisions of the WRC-15 and its Final Acts came into force on 1 January 2017. Further details about WRC are available here: https://www.itu.int/en/ITU-R/conferences/wrc/Pages/default.aspx

177. The new releases of regulatory publications are available here: https://www.itu.int/en/publications/Pages/Newreleases.aspx. Further details about regulatory publications can be read here.

178. The ITU organizes World Radiocommunication Seminars (WRS) on a biennial basis, in complement to the cycle of Regional Radiocommunication Seminars (RRS). WRS deal with the use of the radio-frequency spectrum and the satellite orbits, and, in particular, with the application of the provisions of the ITU Radio Regulations. The WRC-22 was organised in Geneva, Switzerland from 24 to 28 October 2022. More information please visit: https://www.itu.int/wrs-22/.

Action Line C4: Capacity-Building

Related to SDGs: SDG 1 (1.b), SDG 2, SDG 3 (3.7, 3.b, 3.d), SDG 4 (4.4, 4.7), SDG 5 (5.5, 5.b), SDG 6 (6.a), SDG 12 (12.7, 12.8, 12.a, 12.b), SDG 13 (13.2, 13.3, 13.b), SDG 14 (14.a), SDG (16.a), SDG 17 (17.9, 17.18)

179. Within the framework of its mandate as facilitator for Action Line C4, the ITU organized the facilitation meeting of Action Line C4 on *Meeting the demand for digital capacity development*, which took place as an integral part of the WSIS Forum 2022. ITU, UNDP, UN OSET jointly organised the meeting, which was held on Wednesday, 11 May 2022 from 16:00 to 17:00 under the theme of "Meeting the demand for digital capacity development." This session discussed that, although access divide is close to being bridged, there are huge barriers that remain to Internet usage, especially the lack of digital skills for all for people to engage in the digital ecosystem and it is a major priority for the United Nations to narrow digital rights and to make sure that no one is left behind. The session explored the challenges and opportunities on how stakeholders can collaborate and address strategies and policies with the aim to address the demand for capacity and skills development in the field of digital technologies and to help the individuals and organizations grow the skills and attitudes they need in order to thrive for.

180. Several conclusions were reached during the meeting such as:

- The lack of digital skills and literacy is one of the main reasons for people in developing countries not using the Internet, nevertheless, there is also a big demand for people with digital skills in top markets across the world;

- The biggest area of intervention is to reach out to those at the bottom of the pyramid, i.e. around the 1.8 billion people who live on less than $2 a day who are typically, not yet using the Internet and have very little or no digital literacy skills. Efforts need to be made to offer targeted training opportunities at community level to those who don't have Internet access by involving local delivery partners and stakeholders;

- Although access divide is close to being bridged, there are huge barriers that remain to Internet usage, especially the lack of digital skills for all for people to engage in the digital ecosystem and it is a major priority for the United Nations to narrow digital rights and to make sure that no one is left behind;

- Digital connectivity is fast becoming the global metric of inclusion and exclusion as for instance not having the appropriate digital skills have prevented many people from working or from studying during the pandemic, as well as during ongoing crisis situations;

- The Albanian experience and the curriculum that they have developed could also be shared with other countries, possibly as a template for them to start;

- When formulating capacity building and development activities key important issues needs to be taken into consideration: scalability, sustainability, they should be more tailored and based on needs.

181. Please find the complete details on session and the outcomes here.

182. The Action Line 4 thematic is linked to many SDGs.

- SDG 1: development of domestic policies to ensure that ICTs are fully integrated in education and training at all levels. Creation of policy frameworks requires stakeholder engagement, analysis and interpretation of data for targeted policy interventions which can be achieved through skills development programs.

- SDG 2: With the emergence of e-agriculture and the growing need for the knowledge in the use of ICT's, capacity building interventions focused at development and promotion of programmes to eradicate illiteracy using ICTs at national, regional and international levels, will contribute to knowledge growth and inclusion. It also focuses on building the capacity to use ICT tools to increase crop production, adopt modern farming methods, predict weather patterns, and in the process work towards eliminating hunger and creating food security.

- SDG 3: To support research and strengthen capacity of developing countries for early warning, risk reduction and management of national global health risks, activities include design of specific training programmes in the use of ICTs in order to meet the educational needs of information professionals, such as archivists, librarians, museum professionals, scientists, teachers, journalists, postal workers and other relevant professional groups which focuses not only on new methods and techniques for the

development and provision of information and communication services, but also on relevant management skills to ensure the best use of technologies.

- SDG 4: Action Line C4 focuses on development and promotion of programmes to eradicate illiteracy using ICTs at national, regional and international levels, with the aim of increasing the number of people with relevant ICT skills and to facilitate employment and entrepreneurship in the ICT sector.

- SDG 5: Work on removing the gender barriers to ICT education and training and promoting equal training opportunities in ICT-related fields for women and girls, is part of the action line, with early intervention programmes in science and technology targeting young girls with the aim of increasing the number of women in ICT careers as well as promotion the exchange of best practices on the integration of gender perspectives in ICT education.

- SDG 6: Development of distance learning, training and other forms of education and training as part of capacity building programs, is part of the capacity building initiatives that supports countries interventions giving special attention to developing countries and especially LDCs in different levels of human resources development.

- SDG 12: Raising awareness on sustainable consumption and production in today's era requires the use of technology. The action line therefore impacts on this SDG by enhancing technological capacity of countries through training and development initiatives that target ICT's and related areas, as well as building a more inclusive information society.

- SDG 13: WSIS Action Line C4 promotes creation by governments, in cooperation with other stakeholders, of programs for capacity building with an emphasis on building a critical mass of qualified and skilled ICT professionals and experts.

- SDG 14: Empowering communities in ICT use and promoting the production of useful and socially meaningful content is a capacity building intervention that can increase scientific knowledge and promote innovation and research.

- SDG 16: WSIS Action Line C4 focuses on promotion of international and regional cooperation in the field of capacity building, including country programmes developed by the United Nations and its specialized agencies.

- SDG 17: Capacity building initiatives contributes to the SDG through the design and implementation of regional and international cooperation activities to enhance the capacity, notably, of leaders and operational staff in developing countries and LDCs, to apply ICTs effectively in the whole range of educational activities. Also, through the launch of pilot projects to design new forms of ICT-based networking, linking education, training, and research institutions between and among developed and developing countries and countries with economies in transition.

183. Two Emerging Trends related to WSIS Action Lines were identified during the meeting:

- AI, and technology in general, allows for better access to health care

- The pandemic has allowed for digital learning platforms to become more accessible for greater amount of people

184. The WSIS Prizes 2022 Winner for the Action Line C4 is **Development of women's entrepreneurship and IT skills Tumaris.Tech**, Uzbekistan. Details of the project are available here.

185. The ITU continues to support its **Centres of Excellence (CoEs)**. The Centres of Excellence (CoE) programme was launched by ITU at the turn of the millennium, with the aim to support capacity development in the field of information and communication technologies (ICTs) by offering continuous education to ICT professionals and executives in the public and private spheres through face-to-face, online or blended learning. The CoE initiative evolved over the years to become one of the ITU's key training delivery mechanisms. With the support from multilateral and regional organizations, CoE networks have been established in a number of regions including Africa, the Americas, Arab States, Asia-Pacific, Commonwealth of Independent States (CIS) and Europe. Under the umbrella of the ITU Academy, these regional networks are brought together into a single global network sharing expertise, resources and capacity-building know-how in telecommunications and ICT training/education.

186. Following the adoption of the priority areas for the next four years by the World Telecommunication Development Conference (WTDC 2017), an open and transparent application and selection process for new Centres of Excellence for the next four years was undertaken. A total of 28 new Centres were selected for the 2019-2022 cycle, out of a total of 64 applications received and processed. Training activities under the Centres of Excellence have been taking place in all the 6 regions. Due to Covid-19 pandemic, all courses have been moved to online modality and CoE partners in all regions have shown great resilience, flexibility and adaptability.

187. A regional governance structure for the Centres of Excellence has been put in place in the form of regional Steering Committees which meet twice every year to oversee the operations of the Centres of Excellence and provide strategic direction and advice to ITU. The Centres of Excellence have proved to be a key vehicle for training and capacity building for the ITU membership.

188. CoE trainings cover topics such as Spectrum Management, Digital Broadcasting, Cybersecurity, Innovation & Entrepreneurship, Digital Economy, Wireless and Fixed Broadband, Internet of Things, Big Data & Statistics, Artificial Intelligence, Smart Cities & Communities, ICTs & the Environment, ICT Applications, Digital Inclusion, and Conformance & Interoperability.

189. As the main ITU umbrella for training activities, the ITU Academy several courses under the ITU Spectrum Management Training Programme (SMTP). This program consists of 9 modules at Basic level and six modules at Advanced level, leading to the award of a professional ITU certificate, or even a degree, if taken through university. Agreements have been signed with partners to deliver SMTP and discussions are ongoing with other Universities and training institutions such as Centres of Excellence, interested in delivering this program as part of their curricula. SMTP in partnership with Afralti has been particularly successful with a growing flow of participants. SMTP is in the process of

translation into French and has already been translate into Spanish. SMTP courses in Spanish are well attended with an average of about 60 participants each. A Quality of Service Training Program (QoSTP) has also been developed. In 2021, a self-paced online course on Introduction to Service Quality Regulation was launched and has rallied a large support from participants all over the world. A training programmes which is currently being developed is the Internet of Things Training Programme. A Masters in Communications Management degree programme in collaboration with the United Kingdom Telecommunications academy (UKTA) is ongoing with a significant number of participants.

190. ITU launched the Digital Transformation Centres (DTC) initiative. The initiative seeks to create a global network of centres, whose main purpose is to develop digital skills mainly at basic and intermediate level for citizens. 9 DTCs have been selected for the first phase which ran from January 2020 to end of August 2021. The 9 DTCs selected were from Africa (4), Americas (2), and Asia Pacific (3) regions. In response to the COVID-19 crisis, the Phase 1 DTC trainers were provided with tools and skills on how to conduct remote teaching. The train-the-trainers online courses were offered in collaboration with Cisco. Building on the success, and the lessons learnt, of the first phase of the Initiative, the second phase aims to increase the number of DTCs and further strengthen and scale the impact of the network. Preparations for the second phase start on 22 July 2021 with the opening of applications for new institutions wishing to join the network. The closure date for applications has been extended to September 19, 2021 and the selection process takes place in the month of October 2021.

191. The ITU Academy website has been redeveloped and redesigned to provide users with a user-friendly interface, easier navigation, and modern feel and look. The innovative design and features transform the new ITU Academy into the main online gateway to all ITU's capacity development activities. The primary objective of the new website is to harmonize and integrate all ITU capacity development products and services. A steep user growth was experienced in 2020, which has also continued into 2021, largely due to COVID-19 pandemic. ITU Academy has also expanded its course offerings and now has over 150 courses promoted in the first 3 quarters of the year.

192. Close contact has continued with the BDT on work of mutual interest to ITU R and ITU D. The BR has participated in relevant meetings of ITU D Study Groups, Rapporteur Groups and TDAG, where liaison activities have involved topics such as spectrum management, digital broadcasting and migration from analogue systems, transition towards and implementation of IMT, and broadband wireless access technologies. These topics are in addition to the collaboration undertaken through ITU D Question 9-3/2 that calls for the identification of study topics in ITU R (and ITU T) considered of particular interest to developing countries.

193. During 2021, as part of the ITU-R capacity building programme, two Regional Radiocommunication Seminars have been conducted: RRS-21-Americas (26 April − 7 May 2021) and RRS-21-Africa (5-16 July 2021), in order to foster knowledge on spectrum management, the Master International Frequency Register (MIFR), the ITU Radio Regulations, the World Radiocommunication Conference, the Radiocommunication Assembly and agenda of WRC-23. These seminars also included training on ICT tools for

frequency notifications as well as information on BR and BDT spectrum management activities as well as tutorials on the use of these tools for notification procedures of terrestrial stations and space stations. Moreover, each Seminar was culminated with a Forum on topics of interest for each region.

194. A third Regional Radiocommunication Seminar is planned from 11 to 22 October 2021 for the Asia and Pacific Region (RRS-21-Asia-Pacific). The Seminar will conclude with a Forum on "Radiocommunication Trends: Opportunities and Challenges for the Asia-Pacific Region".

Action Line C7: ICT Applications

Action Line C7: E-Government

Related to the SDGs: SGD 9 (9.c), SDG 16 (16.6, 16.7, 16.10), SDG 17 (17.8)

195. The Action Line C7 E- Government Facilitation Meeting was held on Monday, 30 May 2022 together with the Action Lines C1 and C11. The title of this session was "Creating synergies and partnerships on e-government between national and local levels". Concerning the E-Government issues, the session discussed how the United Nations E-Government Survey best contribute to the realization of the SDGs for all segments of society, the main modalities for delivering services in digital government, and the critical trends in digital government and main issues and challenges. Find more details on this session here.

196. The WSIS Prizes 2022 Winner for the Action Line 7 on e-Government is Digital Land Tax, Bangladesh. Details of the project are available here.

197. ITU-Estonia-GIZ-DIAL Digital Government project: the GovStack initiative

ITU in collaboration with Estonia, GIZ/Germany and the Digital Impact Alliance have jointly launched the GovStack initiative[3], which is an effort to accelerate governments digitalization and Transformation towards the attainment of SDG.

The initiative is an expert community-driven multistakeholder effort aimed at assisting countries to build a shared "Digital Government Services Infrastructure" or a "Government Technology Stack" that is constituted of a set of reusable common foundational digital capabilities and services – called also Building Blocks – such as Digital ID, Information Exchange, Payments Gateway, Registrations, Security, etc. that can be used by the whole-of-government through any government agency or department to build new government digital services without having to design, test and operate the underlying systems and infrastructure themselves. This "digital public services infrastructure" effectively sits 'on top' of the internet, is ubiquitous, available for all (i.e., as a utility) and provides the basic requirements to accelerate a sustainable digital

[3] www.govstack.global

economy. It is therefore the engine or the heart of green digital transformation. It will reduce the time and effort needed to introduce new truly green and sustainable digital services that could be scaled up and upgraded in a more agile, accelerated, and cost-effective manner.

198. Smart Villages Niger

The Smart Villages project in Niger aims to transform 20 rural villages into smart villages during its first phase. It will deploy a range of ICT-enabled solutions to the villages selected by the Government of Niger based on the successful proof of concept that has been conducted earlier in two villages in Niger. It will bring about a positive change in the quality of life by providing connectivity and new ICT-enabled services to the local communities while also promoting interoperability, cooperation, and holistic demand-driven response to the SDG-related needs.

199. Smart Islands[4]

A Joint Programme (JP) was developed related to "Accelerating SDG achievement through digital transformation to strengthen community resilience in Micronesia" to be funded by the Joint SDG Fund. The programme adopts an SDG-based approach to digital transformation across Micronesian countries. Digital technologies, as experienced worldwide during the pandemic, serve as a powerful tool to facilitate the much needed social and economic transformation towards the achievement of the SDGs as Pacific Islands Countries continue to embark on the digital transformation journey. The traditional supply-side, siloed approaches to providing public goods and services do not address the problem in a holistic and sustainable manner. An SDG based integrated planning approach (policy, legislation, strategy and delivery of digital services) customized to local needs and priorities can address multiple high priority challenges experienced by the citizens through digital devices and service.

Fundamentally, two outcomes are targeted: Outcome 1: Promoting enabling policy and legislative framework that benefit communities and vulnerable groups that accelerate achieving SDGs and digital transformation (including internet development). Outcome 2: Access to resilient broadband connectivity facilitated through pilots in at least 5 remote islands and villages, one each in the 5 countries, to accelerate their digital transformation to smart islands / digital villages with access to a range of digitally enabled services that meaningfully improve: livelihoods; healthcare; the enjoyment of human rights; skills in harnessing the digitally enabled services; education and job opportunities, food availability and nutrition; digital finance and information; response to natural disasters; maritime security.

200. The project addresses the need of interventions that would help African countries to transform into digital economies and to adopt e-applications geared to sustainable development in various aspects of African economies. The project provides a model for assistance in the development of digital inclusive services and interventions specifically targeted at achieving social and economic development and inclusion through improving

[4] Smart Islands (itu.int)

digital literacy and access. The project seeks to establish a model in Niger that could be replicated in other countries in the region by learning from experiences and lessons.

Action Line C7: E-Health

Related to the SDGs: e-health: SDG 1 (1.3, 1.4, 1.5), SDG 2 (2.1,2.2), SDG 3 (3.3, 3.8), SDG 5 (5.6, 5.b), SDG 17 (17.8, 17.19)

201. ITU/WHO organised WSIS Action Line Facilitation Meeting C7: E-Health on Friday, 3 June 2022. The theme of the meeting was "How can digital be the enabler for health care of today and tomorrow". More details on this session here.

202. The WSIS Prizes 2022 Winner for Action Line C7 on E-Health is **MonitorFCS App and COVID-19MX App**, Mexico. Details of the project are available here.

203. The WHO-ITU have initiated a project (2017-2021) to establish an mHealth Knowledge and Innovation Hub through financial support the European Commission (EC) Horizon2020 Programme. This will enable both the development of national mHealth interventions in selected EU member states to champion the uptake of mHealth and the foundation and maintenance of a centralised 'Knowledge and Innovations Hub for mHealth' to monitor and enable mHealth adoption and innovation.

204. ITU developed content for the specialized multimedia courses focusing on the use of ICTs in healthcare, including telemedicine and courses for IT specialists on the maintenance of medical information systems (jointly with Odessa National Academy of Telecommunications, Ukraine).

205. In the 2017-2021 study period this topic is addressed by ITU-D Study Group 2 *Question 2/2: Telecommunications/ICTs for e-health.* The final report from the 2014-2017 study period on "Information and telecommunications/ICTs for e-health" is available at the following link.

206. ITU-T study groups developed the following Recommendations and other texts:

- **ITU-T F.780.1 (V2) (revised) "Framework for telemedicine systems using ultra-high definition imaging"** describes requirements for using ultra-high definition (UHD) imaging, such as 4K and 8K video, for telemedicine. The purpose of these requirements is to use UHD systems for medical practices that use endoscopes and/or microscopes. This Recommendation also describes a list of requirements for using a UHD-based "endoscopic video camera" as a medical device. In addition, Annex A describes the requirements on the use of this technology as a medical device. This revision adds the clause for profiles of UHD imaging for medical services, as well as new definitions and abbreviations.

- **ITU-T F.780.2 "Accessibility of telehealth services"** defines accessibility requirements for technical features to be used and implemented by governments, healthcare providers and manufacturers of telehealth platforms to facilitate the access and use of telehealth services by persons with disabilities, older persons with age-related disabilities and persons with specific needs.

  Technical requirements defined in this Recommendation are based on a comprehensive feedback collected from civil society on barriers that persons with disabilities experience when accessing and using telehealth services, as well as on the feedback from the industry. This is a first edition of the document. This Recommendation was developed collaboratively by the World Health Organization (WHO) and ITU.

- **ITU-T H.870 (V2) (revised) "Guidelines for safe listening devices/systems"** describes the requirements on safe listening devices and systems, called personal/portable audio systems, especially those for playing music, to protect people from hearing loss. It also gives a glossary for common understanding as well as background information on sound, hearing and hearing loss. It recommends the criteria for avoiding unsafe listening: one for adults and the other for children, both based on the equal energy principle, the assumption that equal amounts of sound energy will cause equal amounts of sound induced permanent threshold shift regardless of the distribution of the energy over time. Importantly, this Recommendation provides guidelines on health communication for safe listening so that appropriate warning messages can be delivered effectively when necessary. Examples of such messages can be found in Appendix VII. Finally, this Recommendation also gives information about the implementation of dosimetry and related issues. Communication devices and assistive devices are excluded from the scope of this Recommendation. Gaming devices are also for future study. This standard was developed collaboratively by the World Health Organization (WHO) and ITU under the 'Make Listening Safe' initiative, and it is adopted by both organizations.

- **ITU-T L.1016 "Method for evaluation of the environmental, health and safety performance of true wireless stereo headphones"**: In recent years, more and more headphones belonging to the group of True Wireless Stereo products are sold. In 2019, sales of TWS earbuds surpassed the sales of (non-TWS) wireless earphones. The advent of True Wireless Stereo headphones raises the question on their performance in terms of health and safety of the user. There is a close link between the health/safety of the user and substances used in True Wireless Stereo headphones. The concept of products with minimal substances of concern and phasing out of harmful substances for non-essential uses is one of the key aspects in the European Sustainable Chemicals Strategy, which is an important building block towards a zero pollution goal, essential for a circular economy. While the idea of non-essential uses is somewhat new in EU legislative initiatives, it originates from the 1978 US Toxic Substances Control Act, and was taken up by other countries like Canada. The concept was finally enshrined in the Montreal Protocol, designed to protect the ozone layer. As more and more countries recognize the importance of a circular economy to combat climate change, the notion of products with minimal substances of concern gains relevance. With

increasing relevance, the need for a method to compare the environmental, health and safety performance of TWS products is rising. This Recommendation aims to establish a methodology to evaluate a score of aforementioned aspects.

- **ITU-T X.Suppl.38 "Supplement to ITU-T X.1152: Use cases for contact tracing applications to prevent spread of infectious diseases"** (under publication) describes various use cases for contact tracing technologies. It also provides data processing models including their procedures, data processing flow and security considerations. In addition, practical use cases are described in Appendix I.

207. The Radio Regulations defines, under RR No. 1.15, the *industrial, scientific and medical (ISM) applications* (of radio frequency energy) as: *"*Operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of *telecommunications*." Frequencies for the use of ISM applications are identified in the Radio Regulations.

208. ITU-R Study Group 1 identified some frequency ranges for Short Range Devices (SRDs) that are used in some health applications (e.g. Assistive Listening Systems).

209. ITU-R Study Group 5 developed Recommendation ITU-R M.1076 on impaired hearing solutions.

210. In February 2021, Recommendation ITU-R M.2150-0 on "Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2020 (IMT-2020)" (developed under the responsibility of ITU-R Study Group 5) was approved. Similar to previous mobile generation technologies, this work is the basis for the development of 5G systems that provides great improvements and benefits to several ICT applications, including e-health, e-agriculture, e-manufacturing, intelligent transport systems, smart cities and traffic control, etc., to facilitate the development of the digital economy.

Action Line C7: E-Agriculture

Related to the SDGs: e-agriculture: SDG 1 (1.5) , SDG 2 (2.3,2.4,2.a) , SDG 3(3.d), SDG 4, SDG 5 (5.5), SDG 8 (8.2) , SDG 9 (9.1, 9.c) , SDG 12 (12.8), SDG 13

211. The Action Line C7 E-Agriculture Facilitation meeting was held jointly by ITU and the Food and Agriculture Organization (FAO) entitled "ICTs for Well-Being, Inclusion and Resilience: through digital skills for youth and women in agriculture" on Thursday, 2 June 2022. This session has two separate parts: I. Presentations on digital skills for women and youth; and II. Panel discussion on challenges and solutions. During the session, different agencies presented the challenges faced by women and youth in the adoption of digital technologies and how low digital literacy and skills affect its uptake. The key challenges are summarized as follows:

212. Youth are the forefront of digitalization and they have a higher potential to drive digitalization. They also have higher interest and familiarity with digital technology and more likely to be early adopters. However, there is still usage gap even for people who are living in areas that are covered by mobile network. Meanwhile, there is some gender difference in terms of smartphone ownership, and only one in four had received training on digital skills with women have less access. Also, women in particular face certain social norms which make the time and location for skill training should be socially acceptable. Furthermore, the audience cares more about the real implementation such as how to reach rural youth and women, how to solve language issues, and what technologies can actually benefit rural farmers. More details on the session here.

213. ITU in collaboration with FAO are developing a study to understand better the status of digital agriculture transformation in the sub-Saharan Africa region. The goal of the study was to assess and document the status of digital agriculture in the region; summarize the key findings on the status; and draw potential opportunities for digital agriculture transformation in Sub-Saharan Africa in the respective 47 countries. The results would enable both ITU and FAO to prioritize investments in digital agriculture but also offer other interested parties to use these results as for their own intervention. This study is desk-based research, which consulted various national, regional and international reports. Additionally, the research team also initiated an e-consultation process to gather the views and lastly consulted FAO and ITU country teams to validate each country profile. The study examined the digital agriculture transformation process through six thematic areas (Infrastructure, Digital Penetration, Policy and Regulation, Business environment, Human Capital and, Agro-innovations) supported by relevant indicators that enables a better understanding of the digital agriculture maturity at national level and regional level.

214. The WSIS Prizes 2022 Winner in category e-Agriculture is **Agriculture Holdings Platform (HSR)**, Saudi Arabia. Details of the project are available here.

215. The series of most recent publications documenting success stories and promising practices in e-Agriculture are available here: https://www.itu.int/en/ITU-D/ICT-Applications/Pages/e-agriculture-in-action.aspx.

216. In the 2017-2021 study period this topic is addressed by ITU-D Study Group 2 Question 1/2: Creating smart cities and society: Employing information and communication technologies for sustainable social and economic development. The final report from the 2014-2017 study period on "Creating the smart society: Social and economic development through ICT applications" available at the following link.

217. Established by ITU-T Study Group 20 on "Internet of things (IoT) and smart cities and communities (SC&C), Focus Group on Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture (FG-AI4A), explores the potential of AI and IoT in supporting the adoption of innovative practices for agricultural production, while examining the barriers related to their use, and best practices for their optimal deployment. In this context, FG-AI4A will focus on three key aspects including how to leverage AI and IoT and other emerging technologies for (i) data acquisition and management, (ii) conducting modelling, and (iii) facilitating effective communication for timely interventions, based on data derived related to agricultural production processes. The activities of FG-AI4A are being carried out in close collaboration with FAO.

Action Line C7: E-Environment

Related to SDGs: SGD 9 (9.4), SDG 11 (11.6, 11.b), SDG 13 (13.1, 13.3, 13.b), SDG 14, SDG 15

218. The Action Line C7: E-Environment Facilitation Meeting on Digital Public Goods for Climate Change Adaptation was held on Monday, 30 May 2022 as an integral component of the WSIS Forum 2022. It was co-organized by WMO, ITU and UNEP. The session drew attention to the belief that without adequate open data to properly inform decisions, efforts to respond to climate change will fall short of their potential. It supported the call for a renewed commitment to free and unrestricted exchange of weather, climate, and hydrological data and specifies that this should include more openly licensed datasets aligned with the Digital Public Goods Standard. More details on this session here.

219. This session was mainly linked to the following SDGs: SDG 9, 13, 14, and 15.

220. The WSIS Prizes 2022 Winner for the Action Line C7 on E-Environment is **#YREstayshome challenge**, Denmark. Details of the project are available here.

221. The Development sector of the ITU has undertaken several activities falling under the Action Line c7 e- environment, in particular Emergency Telecommunications and e-waste. On the e-waste side the following activities have taken place:

1) **E-waste:**

1.1. Global E-waste Statistics Partnership

EACO Regional WEEE Data Harmonization:

ITU and the UNITAR-SCYCLE Programme, founding members of the Global E-waste Statistics Partnership (GESP), are working with the EACO secretariat on the *EACO Regional E-waste Data Harmonization* initiative to provide technical assistance to EACO member states. The project will support the relevant strategic actions of the Regional E-waste Management Strategy, including tracking progress and achievements, and harmonizing regional e-waste data collection. This will eventually result in a central database on e-waste within the EACO secretariat. The project's duration is from March 2021 to December 2022.

In order to assist the East African Communications Organization in tracking progress toward meeting a regional e-waste management strategy, and harmonizing the collection of e-waste data regionally, the GESP developed regional baseline surveys to collect e-waste data for households and businesses in Tanzania, Rwanda, Uganda, Burundi, Kenya, and South Sudan. The surveys were piloted by collecting e-waste data from 504 households and 300 businesses in Kenya, and 407 households and 100 businesses in Burundi.

Regional E-waste Monitors (Latin America, Western Balkans, CIS+ and Arab States):
Based on the success of the Global E-waste Monitors, a number of regional e-waste monitors have been produced through various projects. Regional E-waste Monitors include Latin America (2022), CIS+ Georgia (2021), and the Arab States (2021). A monitor is currently in development under an ITU-UNEP project for the Western Balkans.

ITU is also working on securing funds for the 2023 Global E-waste Monitor which will present cutting-edge research into key areas such as the circular economy, green data centres, and the status of e-waste legislation globally.

Global E-waste Statistics Partnership website:
The GESP has achieved a series of milestones in its aim to provide access to detailed and reliable open data about e-waste within publications and via the GESP website. The website publicly visualizes e-waste indicators on e-waste generated and e-waste formally collected. The map feature also allows to explore country specific data and legislation system. A new and relevant *about us* video was created for the site.

E-waste Statistics Technical Assistance:

Regional capacity-building workshops have been conducted so far in East Africa, Latin America, Eastern Europe, and the Arab States. National capacity building has been provided in Botswana, Namibia, and Malawi, where national e-waste monitors are being finalised for publication, with the national statistics offices taking a lead in the quantification of e-waste generation, flows and importation of electronics. More than 360 people from 60 countries have been trained on the internationally adapted methodology. Where possible, the GESP involves South-South training and collaboration in workshops.

E-waste Statistics Blended E-learning:
An e-learning course was developed in order to transpose in-person e-waste statistics capacity building into a self-paced online course, through the ITU Academy. The course will allow for blended instruction between online and in-person delivery. Prior to attending in-person seminars, participants will have opportunity to collect the necessary data and get acclimated to the e-waste statistics tools by taking the online training, which will be by invitation only and offered over a 2 to 4-month period.

1.2. E-waste management awareness raising

Fifth edition of International E-waste Day in collaboration with WEEE Forum:
BDT/EET collaborated with the WEEE Forum in promoting the fifth edition of International E-waste Day, which took place on 14 October 2021. Some of the areas of collaboration included a joint publication of a thought paper. The thought paper, *Global and*

Complementary Actions for Electronics Extended Producer Responsibility presents complementary solutions and concepts to propel e-waste collection rates in line with EPR-based regulation, whilst also delving into the perceived need for an international regime around EPR to assist with harmonization efforts.

Industry collaboration on shaping a circular economy for the electronics industry:
ITU (both BDT and TSB) joined the Circular Electronics Partnership (CEP) as a partner. The CEP includes almost 50 companies who have come together to develop an industry vision and roadmap until 2030 for the electronics sector. ITU took part in the panel discussion of the new CEP publication *Circular Electronics System Map: An Industry Blueprint for Action* this year at the multi-stakeholder dialogue hosted by CEP. The blueprint provides a common understanding of what circularity means for the electronics sector and guides companies and other stakeholders in creating a circular electronics system.

1.3. Development of national e-waste management strategies, policies and regulations

Implementing the EPR concept in policies and regulations for the sound management of e-waste
ITU has provided technical assistance to 9 Member States to support the development and implementation of national e-waste management strategies, policies, and regulations. Support was also given to the nations of Botswana, the Dominican Republic, Namibia, Rwanda, The Gambia, and Uzbekistan. The work, part of a larger project between UNEP and ITU on EPR concept application for sustainable e-waste management, implements UNEP and ITU tools for e-waste management in the context of policy and regulatory development. More than 133 stakeholders from the public sector and 145 from the private sector have been involved.

In Burundi, Botswana, Malawi and Namibia, ITU supported the development and validation of a draft national policy on the management of e-waste. In Dominican Republic, a national e-waste management regulation is being finalized and reviewed by the Minister of Environment.

An e-waste awareness raising campaign was launched at national level in Rwanda with the aim of increasing collection of e-waste at dedicated drop-off points, and sensitize the population on the issue of e-waste.

Through this programme of work and phase two of the project, ITU will continue to push on the global agenda of circular economy, in line with WTDC Resolution 66 (Rev. Kigali, 2022). This position will be stronger with UNEP as a key project partner.

A deep dive into EPR policy

ITU is creating an e-learning that will be offered on the ITU Academy without cost. Anyone in the public will be able to use the online training. It will primarily be utilized by ITU for public sector players to have a better grasp of how an EPR system can operate as they work on their national e-waste systems. The work is part of ITU's technical assistance to countries in the development of national e-waste management strategies, policies and regulations.

2) **Climate Change:**

2.1. Early warning systems

ITU is supporting the UN initiative *Early Warning Systems for all*. This climate change adaptation measure, announced by the UN Secretary General in March 2022, stipulates that by 2027 every person in the world should be protected by an early warning system. To achieve this goal, ITU will highlight the opportunities brought by the growth in digital services to effectively reach and deliver alerts to people at risk; especially over mobile cellular networks, which reach a very large percentage of the population. ITU will work closely with WMO and other partners in supporting the UN Global Early Warning Initiative by engaging mobile network operators and regulators, as well as identifying and sharing best practices and expertise. WMO – which has been designated to lead on this initiative – will present an 'action plan' on the initiative during COP27, in Egypt in November 2022.

2.2. Graduate Institute research project

Through the Generation Connect Research Agenda with Academia initiative, ITU collaborated with a group of four postgraduate students from the Graduate Institute of International and Development Studies in Geneva on a capstone research project on *ICTs for Climate Change Action*. The goal of the initiative was to provide university students with an opportunity to engage in key areas of ITU's work.

The project aimed to understand how emerging digital technologies can be leveraged to mitigate and adapt to the impacts of climate change in the agricultural and energy sectors in Sub Saharan Africa. Through country focused case studies, the research explored how knowledge and technology transfer strategies can advance climate action in Mauritius, Ethiopia, Angola and Madagascar.

2.3. Masterclass at the Generation Connect Youth Summit

ITU developed a masterclass for the Generation Connect Global Youth Summit on *Applying the power of digital technologies for climate action*. The masterclass explored the importance of digital, geospatial and sensing technologies, and presented case-studies demonstrating how digital technologies can provide insights and effective solutions for climate action, and offered ideas for young people globally to get involved in citizen science projects to directly address climate and development challenges. In addition, the Opening Ceremony connected live with youth attending UNEP's Stockholm+50 to explore how young people can enhance sustainability to support a greener and circular economy.

2.4. Digital Public Goods Alliance Climate Change Adaption Call for Action and Report

The Digital Public Goods Alliance (DPGA), International Telecommunication Union (ITU), and the World Meteorological Organization (WMO) are issuing a call for weather, climate & hydrological information datasets to be made open and freely available as digital public goods. This was driven by the efforts of the DPGA's Climate Change Adaptation Community of Practice that focused on DPGs with the potential to impact climate and weather services. Read the report here.

2.5. Collecting data on ICT Industry GHG emissions

To support a green digital transition, ITU collects data from the ICT industry on their Greenhouse Gas (GHG) emissions. A collaborative report on Greening digital companies: Monitoring emissions and climate pledges was released in 2022 by the ITU and the World Benchmarking Alliance (WBA). It documents the emissions and energy use of 150 of the world's leading tech companies. In 2020, the analised enterprises' operating GHG emissions increased to 239 million tonnes, or 0.8% of global emissions. The availability and depth of climate data were found to have certain gaps, and these gaps need to be filled, which can be facilitated by increased country-level reporting of emissions. Therefore, ITU also aims to extend the focus of its tracking of ICT sector emissions by monitoring GHG emissions from country-specific ICT sectors. Building on and expanding the existing data set is important to shed light on the industry's green transition and to guarantee a more holistic approach to emissions reduction and acceleration of low-carbon or carbon-free operations.

2.6. Generation Connect Iconathon

The E-waste Iconathon was an icon design contest that aimed to raise awareness about the global e-waste issue, and leverage the participation of youth globally. Young people ages 18 to 29 were invited to take part and create a universal icon that represents the collection and take-back of e-waste for recycling. The contest was in line with the Generation Connect mission to engage youth and encourage their participation as equal partners alongside the leaders of today's digital change, empowering young people with the skills and opportunities

to advance their vision of a connected future. The top 3 finalists attended the Youth Summit in Kigali, Rwanda, and the winner was selected by vote in the closing ceremony.

222. The Standardization sector of the ITU has undertaken several activities falling under the **action** line c7 e- environment. The following Recommendations were developed:

- **ITU-T L.1034 "Adequate assessment and sensitisation on counterfeit ICT products and their environmental impact"** provides awareness and guidance on counterfeit ICT products' health and environmental impacts. The intention is to create awareness and sensitisation on human health and environmental risks and measures implemented in different countries for risk mitigation.
- **ITU-T L.1035 "Sustainable management of batteries":** Batteries are crucial for the functioning of information and communication technologies (ICTs). Improving their design, prolonging their lifespan, improving their recyclability and preventing the dumping of waste batteries can lower their overall energy consumption, reduce exposure of humans and the environment to hazardous substances and reduce global greenhouse gas emissions. This Recommendation provides guidance on the sustainable management of used batteries in ICT equipment and the environmentally responsible management of waste batteries from ICT products, including waste prevention, minimization, recycling, recovery and final disposal. It also provides information on best practices in recycling batteries for dissemination.
- **ITU-T L.1036 "Scheduled waste management for base station (inclusive of e-waste)"** was developed pursuant general environment quality act of the members country. At the moment, there is no standard governing the scheduled waste specifically in Base Station (BS). Upon the enrolment of 5G era, it is expected a huge global discharge of telecommunication equipment and upgrading of equipment at each BS, globally. This Recommendation is an extension to any requirement as stipulated in national Environment quality or protection acts, a technical requirement for telecommunication industry to adopt as a practice to reduce scheduled waste including e-waste at the Base Station (BS), as well as it provides guidance on how to dispose e-waste from a base station including the shared responsibility of owners and third parties involved.
- **ITU-T L.1040 "Effects of ICT enabled autonomy on vehicles longevity and waste creation"** defines guidelines and requirements on ICT Original Equipment Manufacturer (OEM) vendors providing equipment to autonomous vehicles aiming at reducing the amount of future e-waste. The Recommendation aims to analyse the e-waste risks and other sustainability indicators of autonomous vehicles and propose how these potential challenges can be mitigated. This Recommendation utilises information compiled from stakeholders which can provide good insights into the specified potential challenge.
- **ITU-T L.1050 "Methodology to identify the key equipment in order to assess the environmental impact and e-waste generation of different network architectures":** While an assessment framework for environmental impacts of the ICT sector does exist (as developed by ITU with for example [ITU-T L.1410] on environmental life cycle assessments of information and communication technology goods, networks and services), best practices for equipment

identification, developed specifically to assess the environmental impacts of network architecture, remain lacking. In this Recommendation, key equipment in the networks are identified for smoother LCA calculations. . Different types of network architecture employ different goods which entail differences in terms of energy usage, e-waste generation as well as environmental footprints. This Recommendation will examine three types of network architectures and will suggest an appropriate set of equipment to be considered for each. This Recommendation will begin to support network designers in determining the environmental and circular performance of different network architectures. This Recommendation utilises information compiled from stakeholders which can provide good insights into the specified potential challenge.

- **ITU-T L.1230 "Specifications of 10 kVAC input and up to 400 VDC output integrated power system in data center and telecommunication room":** With the development of big data and cloud computing technology, the quantity and total capacity of the data center and telecommunication room as well as ICT equipment power density is increasing rapidly. Furthermore, it was found that the traditional power systems had the disadvantages of low energy efficiency, high energy consumption and maintenance difficulties in existing data center and telecommunication room. Therefore, it is necessary to develop a new structure of the whole power system, which integrated traditional 10 kVAC voltage distribution equipment, transformer, low voltage distribution equipment and up to 400 VDC equipment. The distribution system of each voltage level is simplified, so that the maintenance work is reduced, and the reliability of the whole power system is improved. This Recommendation includes system composition, general requirements, monitoring system , etc of 10 kVAC input and up to 400 VDC.
- **ITU-T L.1240 "Evaluation method of safety operations and energy saving for power supply system in telecommunication room/building"** specifies the overall evaluation framework, classification of telecommunication room/building, reliability grading, evaluation items, evaluation methods for power supply system in telecommunication room/building. It is applicable to the evaluation of power supply system, maintenance capability, safety operations and energy saving of various telecommunication room/building.
- **ITU-T L.1318 "Q factor: A fundamental metric expressing integrated circuit energy efficiency"** outlines a method and fundamental metric for expressing integrated circuit energy efficiency, the Q factor. The Q factor could be applied to measure and improve the integrated circuit technology behind information and communication technology itself. The method consists of two separate parts: 1) Method and metric development; 2) Examples of Q factor scores for different integrated circuits and energy and carbon saving potentials in relation to Q factors.
- **ITU-T L.1331 (revised) "Assessment of mobile network energy efficiency"** aims to provide a better understanding of the energy efficiency of mobile networks. The focus of this Recommendation is on the metrics and methods of assessing energy efficiency in operational networks. The networks considered are those whose size and scale could be defined by topologic, geographic or demographic boundaries. This Recommendation explains how to extrapolate the measurements made on

partial networks to the level of the total network. Such a simplified approach is proposed as a way of making approximate energy efficiency evaluations at the level of network elements and cannot therefore be considered sufficient for the entire network operation including, for example, transport.

- **ITU-T L.1333 (under approval) "Carbon data intensity for network energy performance monitoring"** defines a KPI useful to evaluate network emissions and give an indication on how a network reduce it emissions due to the energy usage.
- **ITU-T L.1390 "Energy saving technologies and best practices for 5G RAN equipment":** With the rapid development and commercialization of 5G radio communication technology, the 5G network construction is further accelerated. While being an important enabler for digitalization of other industries and thereby contribute to significant energy savings and emission reductions, it is also important to consider the energy consumption of the 5G network infrastructure itself. This Recommendation identifies energy saving potentials, describes energy-saving principles and technologies for 5G RAN and related equipment, and provides best practice recommendations when and how these technologies should be used and controlled thereby reducing the 5G RAN energy consumption, saving operational costs, and making the 5G RAN a green and high-efficiency network.
- **ITU-T L.1480 "Enabling the Net Zero transition: Assessing how the use of ICT solutions impacts GHG emissions of other sectors" (under approval)** provides methodology for the quantitative assessment of the net second order effect of ICT solutions(including first order effects), and also addresses higher order effects such as rebound. By assessing how the use of ICT solutions impacts GHG emissions over time, it aims to provide a fair, transparent and comprehensive assessment of the GHG emissions induced by the use of one or more ICT solutions. Guidance is provided for the following types of assessments: Assessment of the second order effect of one or more ICT solution(s) implemented in a specific context by the user of an ICT solution while considering also higher order effects Assessment of the second order effect of one or more ICT solution(s) implemented at different levels, including at an organizational level (whether a private and public organizations), at a city level, at a country level or at worldwide level, while considering also higher order effects. Assessment of the second order effect one or more specific ICT solution(s) from the perspective of an ICT organization while considering also higher order effects. This includes Assessment of the aggregated effect of all ICT solutions provided by an ICT organization across all customers Assessment of the aggregated effect of one or several ICT solution(s) provided by an ICT organization across customers Assessment of the effect of a specific ICT solution implemented in an actual context for a specific customer.
- **ITU-T L.1481 "Guidance on how to address Connect2030 targets on net abatement" (under approval)** provides guidelines on how to address the Connect 2030 greenhouse gas (GHG) emissions target. It is intended to be utilized by relevant stakeholders of the Connect 2030 ambitions, while considering the sustainable development goal (SDG) 13 and the objectives of the Paris Agreement and the Glasgow Climate Pact. It also presents examples of ICT solutions associated with a potential reduction of GHG emissions in other sectors.

- **ITU-T L.1604 "Development framework for bioeconomy in cities and communities":** Bioeconomy deals with both sustainability and circularity and covers all biological resources. The aim of this Recommendation is to provide cities with a framework for bioeconomy's development, especially under the lens of circularity and sustainability. The main elements examined in this document are: The definition and role of bioeconomy in cities, with a focus on circularity and sustainability. The determination of factors and KPIs that affect bioeconomy development in cities. The definition of a generic implementation framework for bioeconomy in cities.
    - **ITU-T L.1610 "City Science Application Framework":** As urbanization continues to accelerate, urban governance is struggling to adapt to the environmental and sustainability challenges. The high degree of urban sprawl demands urban planning to be reinvented in order to improve land and resource allocations. This creates further tension between urban and peri-urban areas (locations of close proximity to cities) in terms of economic and environmental sustainability. This Recommendation proposes to analyse and solve these urban problems and challenges by using the city science method. It will demonstrate that by using empirical evidence such as data, the city science method provides the most reliable and consistent way for cities to tackle urban challenges.
    - **ITU-T L.1620 "Guide to Circular Cities":** The Guide for Circular Cities contains a circular city implementation framework that is designed to improve circularity in cities and support stakeholders in implementing circular actions. The framework consists of a four-step methodology that provides a consistent method for assessing, prioritising and catalysing different circular actions. This deliverable is developed in response to the growing sustainability challenges that cities are facing and the emergence of the circular economy concept and its applicability and extension in the city setting. The Guide starts with an assessment of the main developmental and sustainability challenges that cities are facing and the ways in which the concept of circular economy can be extended beyond the economic sphere and be applied to different city assets. It further defines key components of the circular city implementation framework. These components include: city assets and products (i.e. various city infrastructures, city resources, city goods and services available for use in a city); circular city actions (i.e. outcome-orientated actions that can be applied to city assets and products); circular city outputs (i.e. the outputs of circular city actions applied to city assets and products); and circular city enablers (i.e. complementary activities which support or accelerate implementation of circular city actions). Each of these components contains different quality and potential for facilitating circularity in cities. The interactions between these components form the basis of the circular city implementation framework. Finally, the Guide explains the circular city implementation framework. This framework utilizes four different steps to assist city stakeholders in enacting circular actions. The first step is to establish a baseline for circularity. The second step is to determine the potential of circularity in different assets and to prioritize circular actions based on the availability resources. The third step is to apply city enablers to catalyse different circular actions. The last step is to evaluate the impacts of these actions. Cities

are invited to use this Guide to identify a course of action for improving circularity. The Guide also includes practical recommendations for preparing circular city actions and their implementation. The Guide is complemented with 17 case studies that illustrate the application of the circularity concept based on experiences from cities around the world.

- **ITU-T L.Suppl.49 "Overview on Adaptation to Climate Change for ICT Networks" (under publication)** provides an updated overview of existing Recommendations and Technical Standards on the topic of Adaptation to Climate Change for ICT networks. In this context, adaptation has to be intended in a double meaning:

  1) how ICT can help other areas (e.g. transports, buildings, …) to adapt to climate change challenges and effects;

  2) how ICT networks themselves have to be designed/implemented in a more and more resilient way, in order to face climate change's effects (e.g. flooding, stronger winds, …).

  This Supplement takes into account also the work already done, on the topic of adaptation to climate change for ICT networks, from other workshops and Academia.

- **ITU-T L.Suppl.50 "Case Studies on Implementation of Cities' circular actions" (under publication)** contains circular city implementation framework that is designed to improve circularity in cities and support stakeholders in implementing circular actions. The framework consists of a four-step methodology that provides a consistent method for assessing, prioritising and catalysing different circular actions. The Recommendation is developed in response to the growing sustainability challenges that cities are facing and the emergence of the circular economy concept and its applicability and extension in the city setting. The Supplement aims to further support the circular city implementation framework by providing 17 case studies on cities implementing circularity in urban operations.

- **ITU-T L.Suppl.51 "Case studies on city science application framework" (under publication)**: By employing scientific techniques and method used by the STI community, city science application framework provides a reliable and consistent way for cities to tackle the rising environmental and sustainability challenges. While Recommendation ITU-T L.1610 "City Science Application Framework" illustrates the methodology behind the application of city science, this Supplement provides success examples of cities that have already employed the city science approach to solve different challenges.

223. The ITU/WMO/UNEP Focus Group on Artificial Intelligence for Natural Disaster Management (FG-AI4NDM) was established in December 2020 to help lay the groundwork for best practices in the use of AI for: assisting with data collection and handling, improving modelling across spatiotemporal scales, and providing effective communication.

224. In particular Smart Sustainable Cities and Climate Change, Internet of Things, Energy Efficiency and E-waste, E-waste and EMF, and have developed important standards and recommendations in the area, please see the activities in detail below.

225. **Smart Sustainable Cities and Climate Change (Past and Upcoming Events)**

Events and Webinars on IoT, Smart Sustainable Cities and Data Management

- DT4CC Episode #12: Interoperability of IoT and satellite data for Earth observation supporting sustainable development, 14 December 2021
- DT4CC Episode #11: Blockchain-based data management for supporting Internet of things and smart cities and communities, 8 December 2021
- DT4CC Episode #10: The role of digital technologies on aging and health, 7 December 2021
- DT4CC Episode #9: Addressing the Security Risks of Digital Transformation on IoT, 6 December 2021
- DT4CC Episode #8: Network capabilities and emerging technologies to support IoT-enabled verticals, 18 November 2021
- DT4CC Episode #7 Crowdsourced Systems: A people-led paradigm, 2 November 2021
- DT4CC Episode #6: Smart City Platforms, 1 November 2021
- DT4CC Episode #5: Smart sustainable cities maturity model and impact assessment, 24 September 2021
- DT4CC Episode #4: Smart Cities: a step towards digital transformation in Latin America, 20 September 2021
- DT4CC Episode #3: Smart sustainable city architectures: challenges and opportunities, 16 September 2021
- DT4CCEpisode #2: IoT-based automotive emergency response system, 14 September 2021
- DT4CC Episode #1: Digital twins in cities, 8 September 2021
- ITU/OiER Webinar on Accelerating the Path to Cities' Digital Transformation, Virtual, 8 September 2021
- Webinar series on Digital transformation for cities and communities, Virtual, September - December 2021
- ITU-T SG20RG-AFR Virtual forum on "Accelerating Digital Transformation in Africa", Virtual, 2 June 2021
- Virtual Forum on "The Role of Standards in Accelerating Digital Transformation for Cities and Communities", Virtual, 23 April 2021
- WSIS Thematic Workshop on "Simple Ways to be Smart", Virtual, 29 March 2021
- Webinar on "Smart sustainable cities and frontier technologies in Latin America", Virtual, 8 December 2020
- Virtual forum on "Digital Transformation of Cities and Communities", Virtual, 7 December 2020

Events and Webinars on ICTs, the Environment and Climate Change, EMFs (Past and Upcoming events)

- 14th Symposium on ICT, Environment and Climate Change (planned), Rome, Italy, 25 October 2022
- Workshop on Global Digital ICT Product Passport to achieve a Circular Economy, Virtual, 1 June 2022

- A Global Portal on Environment and Smart Sustainable Cities is being maintained and highlights the latest external resources related to six distinct topics, including; smart sustainable cities; cities' actions to tackle Covid-19; energy efficient ICTs; climate change;

e-waste management and circular economy; and frontier technologies (e.g. AI, IoT, blockchain). This Global Portal also provides link to ITU's IoT and SC&C Standards Roadmap.

226. **International Standards**

- ITU-T Study Group 5 on Environment, EMF and Circular Economy is responsible for for the development of standards on the environmental aspects of ICT and digital technologies and protection of the environment, including electromagnetic phenomena and climate change.. Study Group 5 will study how the digital transformation can be shaped to ensure it supports transitions towards more sustainable societies.
- Study Group 5 studies issues related to resistibility, human exposure to electromagnetic fields (EMF), circular economy, energy efficiency and climate change adaptation and mitigation. It develops international standards, guidelines, technical papers and assessment frameworks that support the sustainable use and deployment of ICTs and digital technologies, and evaluate the environmental performance, including biodiversity, of digital technologies such as, but not limited to, 5G, artificial intelligence (AI), smart manufacturing, automation, etc. Study Group 5 is also responsible for studying design methodologies and frameworks to reduce the volume and adverse environmental effects of e-waste and to support the transition towards a circular economy.
- ITU-T SG5 is the lead study group on electromagnetic compatibility, resistibility, lightning protection; soft error caused by particle radiations; human exposure to electromagnetic fields; circular economy and e-waste management and ICTs related to the environment, energy efficiency, clean energy and sustainable digitalization for climate actions.
- ITU's 'green ICT' standards are contributing to the reduction of the ICT sector's environmental footprint as well as those of other industry sectors.
- ITU's 'green ICT' standards are contributing to the reduction of the ICT sector's environmental footprint as well as those of other industry sectors.
- Taking into consideration the development of 5G systems, ITU-T SG5 is developing a series of international standards (ITU-T Recommendations, Supplements and Technical Reports) that will study the following environmental aspects of 5G: electromagnetic compatibility (EMC); electromagnetic fields (EMF); energy feeding and efficiency; and resistibility. The following Recommendations and Supplements have been approved or agreed:
    - **ITU-T K.21 (revised) "Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents"** specifies resistibility requirements and test procedures for telecommunication equipment that is attached to or installed within a customer's premises. Overvoltages or overcurrents covered by this Recommendation include surges due to lightning on or near the line plant, short-term induction from adjacent alternating current (a.c.) power lines or railway systems, earth potential rise due to power faults, direct contact between telecommunication lines and power lines, and electrostatic discharges (ESDs). The sources for overvoltages in internal lines are mainly inductive coupling caused by lightning currents being conducted in nearby lightning strikes or lightning currents being conducted by nearby conductors.

- **ITU-T K.76 (revised) "EMC requirements for DC power ports of telecommunication network equipment in the frequency range below 150 kHz"** specifies conducted emissions requirements for DC power ports of telecommunication network equipment in the frequency below 150 kHz. Furthermore, an immunity requirement specific to power ports of telecommunication network equipment with analogue voice interfaces is also defined.
- **ITU-T K.83 (revised) "Monitoring of electromagnetic field levels"** gives guidance on how to make long-term measurements for the monitoring of electromagnetic fields (EMF) in the selected areas that are under public concern, in order to show that EMFs are under control and under the limits. The purpose of this Recommendation is to provide for the general public clear and easily available data concerning electromagnetic field levels in the form of results of continuous measurement.
- **ITU-T K.87 (revised) "Guide for the application of electromagnetic security requirements – Overview":** General guidelines of information security management for telecommunications organizations are presented in Recommendation ITU-T X.1051, which is based on ISO/IEC 27002. In an information security management system (ISMS) based on Recommendation ITU-T X.1051, physical security is one of key issues.

  Recommendation ITU-T K.87, outlines electromagnetic security risks of telecommunication equipment and illustrates how to assess and prevent those risks, in order to manage ISMS in accordance with Recommendation ITU-T X.1051. Major electromagnetic security risks addressed in this Recommendation are as follows:

  - natural electromagnetic (EM) threats (e.g., lightning);
  - unintentional interference (i.e., electromagnetic interference, EMI);
  - intentional interference (i.e., intentional electromagnetic interference, IEMI);
  - deliberate EM attacks via high-altitude electromagnetic pulse (HEMP);
  - deliberate high-power electromagnetic (HPEM) attacks;
  - information leakage from EM emanation (i.e., electromagnetic security, EMSEC).

  Mitigation methods against electromagnetic security threats are also described in this Recommendation.
- **ITU-T K.91 (revised) "Guidance for assessment, evaluation and monitoring of human exposure to radio frequency electromagnetic fields"**: There are many possible methods of exposure assessment and each of them has its own advantages and disadvantages. Recommendation ITU-T K.91 gives guidance on how to assess and monitor human exposure to radio frequency (RF) electromagnetic fields (EMFs) in areas with surrounding radiocommunication installations based on existing exposure and compliance standards in the 8.3 kHz to 300 GHz range. This includes procedures for evaluating exposure and how to

show compliance with exposure limits with reference to existing standards. Recommendation ITU-T K.91 is oriented to the examination of the area accessible to people in the real environment of currently operated services with many different sources of RF EMF, but also gives references to standards and Recommendations related to EMF compliance of products. Recommendation ITU-T K.91 includes an electronic attachment containing an uncertainty calculator and the Watt guard modules.

- **ITU-T K.114 (revised) "Electromagnetic compatibility requirements and measurement methods for digital cellular mobile communication base station equipment"** specifies the electromagnetic compatibility common requirements and test methods for digital cellular mobile communication base station equipment, repeaters and associated ancillary equipment which are independent of any kind of wireless access technologies, such as 2G, 3G, 4G, 5G or others. Test conditions for base stations used in variety modality are described, e.g., macro base station, distributed base station, micro base station, pico base station, integral antenna base station, active antenna base station and OTA active antenna base station. Performance criteria for immunity tests are also specified.
- **ITU-T K.123 (revised) "Electromagnetic compatibility requirements for electrical equipment in telecommunication facilities"** describes the requirements for radiated and conducted emissions from electrical systems installed in telecommunication facilities. Electrical systems in the scope of this Recommendation include inverter driven electrical equipment including the air conditioners needed for the operation of telecommunication systems, personal computers, displays, printers, maintenance robots, and security systems including surveillance cameras. Their electrical systems include power conversion devices and electronic circuits which may generate conducted and radiated electromagnetic disturbances and cause degradation of the performance of nearby telecommunication systems.
- **ITU-T K.124 (revised) "Overview of particle radiation effects on telecommunication systems"** provides basic guidance on soft errors that are caused by particle radiation and that affect telecommunication systems. This Recommendation details the phenomena of soft errors that arise from particle radiation. A brief explanation of the procedures for design, test and mitigation measures are also included in this Recommendation.
- **ITU-T K.130 (revised) "Neutron irradiation test methods for telecommunication equipment"** describes soft error test methods for the telecommunication equipment that composes carrier telecommunications networks. The objective of soft error tests of the telecommunication equipment using an accelerator-driven neutron source is described first. An overview of the soft error tests and operating principles of an accelerator-driven neutron source are then introduced. The requirements of the accelerator-driven neutron sources and test sites are specified. The test conditions including test set-up, operational conditions and error monitoring and test procedures for the telecommunication equipment are specified. Notes for determining specific detailed test methods, such as the neutron flux to be used for irradiation and conditions for counting as failures in estimation of the reliability are also described.

- **ITU-T K.131 (revised) "Design methodologies for telecommunication systems applying soft error measures"** describes the principles and design methods for soft error measures for the equipment that composes carrier telecommunications networks. It also describes basic configurations of telecommunication equipment, definitions and methods to determine reliability requirements and procedures for the design of equipment from the perspective of mitigation of failures caused by soft errors. Also included are the methods to determine the areas, e.g., circuit blocks or circuit packs, requiring soft error measures in telecommunication equipment in order to conform to the reliability requirements. The main design issues to be considered for soft error measures are described as well as the actual design methods for the application of measures against soft errors and their effects. Finally, the reliability evaluation methods using theoretical calculations and tests of actual equipment are described to confirm the effect of the applied measures and conformity to the reliability requirements.
- **ITU-T K.137 (revised) "Electromagnetic compatibility requirements and measurement methods for wireline telecommunication network equipment"** specifies the electromagnetic compatibility (EMC) common requirements and test methods for wireline telecommunication network equipment, used in public telecommunication networks to provide telecommunication services, including voice, data, audio and video to end-users, using all applicable media and all types of wireline access technologies, such as digital subscriber line (DSL), plain old telephone service (POTS), Ethernet, E1, fibre. Test conditions for all types of wireline telecommunication network equipment are described, e.g., access equipment, router and switching equipment, optical transmission equipment, data centre and cloud computing equipment. This Recommendation describes the specific testing levels to be applied to wireline telecommunication environments, such as telecommunication centres, customer premises and outdoor locations.
- **ITU-T K.138 (revised) "Quality estimation methods and application guidelines for mitigation measures based on particle radiation tests"** describes the reliability estimation methods based on the results of a neutron irradiation test taking into account the severity of the effect caused by soft errors. The soft error rate in the natural environment has to be calculated from the number of soft errors that occur during a neutron irradiation test. The severity of the impact of a soft error on telecommunications systems, such as the impact on the client signal and control system is analysed from the error logs created during the test. Additional mitigation measures should be applied if the equipment is less reliable than the target level. This Recommendation also provides guidelines for applying these mitigation measures in light of the results of soft error tests.
- **ITU-T K.139 (revised) "Reliability requirements for telecommunication systems affected by particle radiation"** describes the reliability requirements for telecommunication equipment in relation to the soft errors that are caused by particle radiation. The principles for determination of reliability requirements are described and three types of reliability requirements (alert function reliability, service reliability and maintenance reliability) are defined. Three reliability classes for each type of requirement are defined based on the acceptable soft error

failure rate. Specific values are determined for each type and class of reliability requirement.

- **ITU-T K.147 (revised) "Protection of networked information technology equipment"**: Networked equipment can be subject to overvoltage and overcurrent transients. Both data and any powering services should be resistant to the expected environmental transients. Where equipment has multiple independent ports, such as central hubs, switches, or repeaters, then testing is required for inter-port resistibility. Resistibility testing needs to test for lightning transients coupled into a network by magnetic induction, earth potential rise, resistive coupling and transient coupling by a voltage-limiting operation of surge protective functions or flashover. The voltage limiting operation may convert common-mode surges into differential-mode surges in the signal path. It is also possible for alternating current (AC) mains power faults to couple into the network, which can necessitate the use of overcurrent protection. Recommendation ITU-T K.147 covers the common one-pair, two-pair and four pair link implementations, their configurations, how surges are coupled into the system and what surge mitigation measures are used. Following this overview, the rational for the different surge and power fault test circuit approaches and when they are specified is given.
- **ITU-T K.151 "Electrical safety and lightning protection of medium voltage input and up to ±400VDC output power system in ICT data centre and telecommunication centre"** provides guidelines for electrical safety and lightning protection requirements for medium voltage power electronic converter systems, which has medium voltage input with rated system voltages from 1 000 V AC up to 36 kV AC and low voltage output with rated voltages up to ±400V DC, used in ICT data centre, telecommunication centre, or other application environments. With the development of big data and cloud computing technology, the quantity and total capacity of the data centres and telecommunication centres together with ICT equipment power densities are increasing rapidly. In this condition, it was found that the traditional power distribution equipment and power systems had the disadvantages of low energy efficiency, high energy consumption, high maintenance difficulties, high cost in lots of existing data centres and telecommunication centres. In order to solve the problems above, it is necessary to develop a new structure of whole power system, which may be powered directly by medium voltage and based on power electronic conversion. From the perspective of electrical safety and lightning protection, there are lots of differences between the data centre and telecommunication centre powered by traditional low-voltage AC and that of powered by medium voltage. This Recommendation will be focused mainly on electrical insulation, partial discharge, electrical safety, resistibility and lightning surge protection.
- **ITU-T K.152 "Electromagnetic compatibility requirements for power equipment in telecommunication facilities"** describes the requirements for radiated and conducted emissions from power equipment installed in telecommunication facilities. Power equipment in the scope of this Recommendation include rectifiers that supply direct current (DC) voltages of up to 400 V, power conditioning systems (PCSs) including grid connected power converters (GCPCs),

uninterruptible power supplies (UPSs). The power equipment usually includes power conversion devices and may generate conducted and radiated electromagnetic disturbances and cause degradation of the performance of telecommunication systems and this Recommendation aims to prevent.

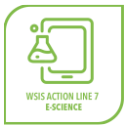
- **ITU-T K.Suppl.16 (revised) "Electromagnetic field compliance assessments for 5G wireless networks" (under publication)** provides guidance on the radio frequency electromagnetic field (RF-EMF) compliance assessment considerations for IMT 2020 wireless networks also known as 5G. Given that the 5G technical standards have just been finalised and commercial 5G networks are not due to be launched before 2019-2020, the first version of this Supplement is to mainly address the computational assessment options and the assessments of trial networks.
- **ITU-T K.Suppl.24 to ITU-T K.20 (revised) "Rationale for setting resistibility requirements of telecommunication equipment installed in a telecommunication centre against lightning" (under publication)** provides the technical information (rationale) for setting the resistibility requirements against lightning in [ITU-T K.20]. This information should be referred to for any revision of [ITU-T K.20]. The rationale described in this Supplement is mainly quoted from past contributions and other documents discussed in ITU-T SG5 during the establishment and revision of [ITU-T K.20]. Also, this Supplement intends to include any rationale for the revision of [ITU-T K.20] in case it is revised.
- **ITU-T K.Suppl.27 to ITU-T K.44 "The 100 kHz ring wave generator" (under publication)**: Some regional standards offer the ring-wave generator as an alternative test procedure. Surges in AC mains branch circuits have been found to show a damped ring wave. This supplement looks at the history of ring waves, the ring wave generator and its parameters. For most purposes the 1.2/50-8/20 generator is sufficiently adequate for surge testing without using a 100 kHz ring wave generator.
- **ITU-T K.Suppl.28 to ITU-T K.44 "Electric shock and related terms and definitions" (under publication)**: An electricity supply voltage classified as extra-low voltage (ELV) has a low probability of causing a hazardous electrical shock. It is important to realise that the actual ELV value is not absolute, but depends on the electrical shock event circumstances. This Supplement covers established definitions, insulation types, equipment classes, electric shock physical reaction levels, electric shock event factors and circuit configuration examples.
- **ITU-T K.Suppl.29 "EMF strength inside and outside of electric vehicle using wireless power transfer (WPT) technology" (under publication)**: The electric vehicle could be the type of transportation system to be used most frequently by the general public in the near future. EMF exposure levels from electric vehicles causes some concern to the general public so they should be assessed for the different type of vehicles. This particular electric vehicle uses dynamic wireless power transfer (WPT) technology to charge its battery with the power delivered from the coils installed underground. In this case, passengers and drivers can be exposed to electromagnetic field (EMF) inside and outside of the vehicle when it is stationary or moving. In each case, two different EMF measurement protocols need to be applied to evaluate the human exposure levels to EMF. This

Supplement 29 to ITU-T K-series Recommendations includes the evaluation results of EMF exposure levels based on the exposure limits inside and outside of the electric vehicles known with the commercial name of OLEV (on-line electric vehicle), developed in Korea.

- ITU-T Study Group 5 created the Focus Group on "Environmental Efficiency for Artificial Intelligence and other Emerging Technologies" (FG-AI4EE). The FG-AI4EE identifies the standardization gaps related to the environmental performance of AI and other emerging technologies including automation, augmented reality, virtual reality, extended reality, smart manufacturing, industry 5.0, cloud/edge computing, nanotechnology, 5G, among others. The focus group develops technical reports and technical specifications to address the environmental efficiency, as well as water and energy consumption of emerging technologies. The FG-AI4EE has already approved twelve technical reports or specification as follows:
    - Technical specification on Key performance indicators for small and medium enterprises to assess the achievement of the sustainable development goals.
    - Technical report on A method for intuitive human interaction with data model (Machine Learning & AI etc.).
    - Technical report on Requirements on energy efficiency measurement models and the role of AI and big data.
    - Technical specification on Guidelines on energy efficient blockchain systems.
    - Technical report on Smart energy saving of 5G base station: Based on AI and other emerging technologies to forecast and optimize the management of 5G wireless network energy consumption.
    - Technical report on Guidelines on the environmental efficiency of machine learning processes in supply chain management.
    - Technical Report on Guidelines on the use of digital twin of cities and communities for better climate change mitigation solutions
    - Technical Report on Best practices for graphical digital twins of smart cities
    - Technical Report on Computer processing, data management and energy perspective
    - Technical Report on Assessing environmentally efficient data centre and cloud computing in the framework of the UN sustainable development goals
    - Technical Report on Guidelines on the implementation of eco-friendly criteria for AI and other emerging technologies
    - Technical Report on Data center energy saving: Application of AI technology in improving energy efficiency of telecom equipment rooms and internet data center infrastructure

A Global Portal on Environment and smart sustainable cities highlights the latest external resources related to six distinct topics, including; smart sustainable cities; cities' actions to tackle Covid-19; energy efficient ICTs; climate change; e-waste management and circular economy; and frontier technologies (e.g. AI, IoT, blockchain).

Action Line C7: E-Science



Related to the SDGs: SDG 1 (1.5) , SDG 4 (4.7) , SDG 6 (6.1, 6.a) , SDG 7 (7.a), SDG 13 (13.1, 13.2, 13.3), SDG 14 (14.a), SDG 15 (15.9) , SDG 17 (17.6, 17.7)

227. UNESCO organised the WSIS Action Line Facilitation Meeting C7:E-Science on 3 June 2022 under the topic of "Access to "existential information" for Climate Change: Is openness of data THE solution to address "existential disinformation"?". More details of the session here.

228. The WSIS Prizes 2022 Winner for the Action Line C7 on E-Science is **Flood Control System**, Indonesia. Details of the project are available here.

229. ITU is one of the co-facilitators together with UNESCO, UNDESA and Regional Commissions, ILO, ITC, FAO, UPU, UNEP, WMO, UNCTAD, WHO, etc. for the eight areas of ICT applications that are covered by WSIS Action Line C7. ITU is running the ITU Academy for trainings on ICT related issues. (https://academy.itu.int/).

Action Line C7: E-Learning

Related to the SDGs: SDG 4

230. As the co-facilitator of Action Line C7 on E-Learning, UNESCO organised a WSIS Action Line Facilitation Meeting under the High-Level Dialogue entitled "Transforming Education Summit and the 2023 GEM Report on technology and education'' at the WSIS Forum 2022. Details of the session is available here.

231. During this session, UNESCO presented the Transforming Education Summit and informed the ongoing research being carried out for the 2023 GEM Report on technology and education.

232. The WSIS Prizes 2022 Winner for the Action Line C7 on E-Learning is **Emirati School Smart Learning Ecosystem**, United Arab Emirates. Details of the project are available here.

233. As the lead agent for all ITU capacity building activities, the ITU Academy continues to produce publications as part of its main deliverables. Some activities on curriculum development are available on the following link: https://academy.itu.int/index.php/main-activities/curriculum-development.

Action Line C7: E-Employment

Related to the SDGs: SDG 4 and SDG 8

234. The Action Line C7 E-Employment Facilitation Meeting, co-organized by the ILO, was held on Tuesday, 10 May 2022. The topic of the meeting was "Digitalization and employment". Details of the session are available here.

235. The WSIS Prizes 2022 Winner in category e-Employment is **E-recruitment**, Palestine. Details of the project are available here.

Action Line C7: E-Business

Related to the SDGs: SDG 1 (1.4), SDG 2 (2.3), SDG 5 (5.b), SDG 8 (8.3, 8.9, 8.10), SDG 9 (9.3), SDG 17 (17.11)

236. The WSIS Action Line C7 E-Business Facilitation Meeting was held on Monday, 30 May 2022 as an integral component of the WSIS Forum 2022. The topic of the meeting was "Data for eBusiness: the value of data to facilitate online trade for MSMEs". It was held in cooperation with the UNCTAD (United Nations Conference on Trade and Development), the ICT (International Trade Centre) and the Universal Postal Union (UPU). This session discussed the value of data to MSMEs in conducting eBusiness. For more details on this meeting please see here.

237. The WSIS Prizes 2022 Winner for the Action Line C7 on E-Business is **Mobile Payment Solution D17**, Tunisia. Details of the project are available here.

Action Line C8: Cultural diversity and identity, linguistic diversity and local content

Related to SDGs: SDG 2, SDG 4 (4.7), SDG 6 (6.b), SDG 8 (8.3, 8.9), SDG 11 (11.4), SDG 12 (12.b)

238. The WSIS Action Line C8 Facilitation Meeting was held on Monday, 30 May 2022 as an integral component of the WSIS Forum 2022 on the topic of "The digitization of culture and

the creative economy: benefits, challenges and roadmaps". It was organised by UNESCO as the lead facilitator of this Action Line. For more details on this meeting please see here.

239. The WSIS Prizes 2022 Winner for the Action Line C8 is **Art and Technology for Climate Change and Green Social Entrepreneurship**, Lesotho. Details of the project are available here.

240. Since 2005, the ITU-D Digital Inclusion group has developed a capacity building programme for indigenous communities. Developed in collaboration with El Fondo para el Desarrollo de los Pueblos Indígenas de América Latina y El Caribe (FILAC), the objective is to empower indigenous people and communities through technology and thus support their educational, social, and economic development, and to contribute to the self-sustainability of indigenous communities and their cultural legacy. Several training programmes have been organised, which benefited more than thousands of indigenous leaders from Latin America and the Caribbean. Many communities have benefited from trainings on innovative communication tools for strengthening ICT knowledge of indigenous communities - with a special focus on how to develop, manage and operate an indigenous community radio network, and other blended trainings such as the Training Programme for Technical Promoters in Indigenous Communities for the Generation, Development and Maintenance of Communication and Broadcasting Network Technologies. More information is available here: https://www.itu.int/en/ITU-D/Digital-Inclusion/Indigenous-Peoples/Pages/default.aspx.

Action Line C9: Media

Related to the SDGs: SDG 5 (5.b), SDG 9 (9.c), SDG 12 (12.8), SDG 16 (16.10)

241. The Action Line C9: Media meeting was held on Wednesday, 20 April 2022 organised by UNESCO. The topic of the meeting was “Rethinking UNESCO Policy Guidelines for the Development and Promotion of Governmental Public Domain Information”. More information of the session here.

242. The WSIS Prizes 2022 Winner for the Action Line C9 is **COVID-19 Radio Response**, Canada. Details of the project are available here.

243. A number of recommendations relevant to providing access to ICTs through terrestrial and satellite radiocommunication and broadcasting infrastructures have been established, and are under study currently, broadcasting infrastructures are particularly relevant in developing countries and/or underserved areas such as remote and sparsely populated areas.

244. Moreover, ITU-T carried out various studies for Internet Protocol TV (IPTV) that will enable enhanced, media rich delivery of content to users around the world, as well as Next Generation Networks (NGN) to reduce international imbalances affecting the media, particularly as regards infrastructure and technical resources. ITU is also working to

enhance accessibility features of audiovisual media delivered by a number of delivery systems through the IRG-AVA.

245. ITU-T Study Group 16 approved the following standards:

- **ITU-T H.266 (V2) "Versatile video coding"** specifies a video coding technology known as Versatile Video Coding and it has been designed with two primary goals. The first of these is to specify a video coding technology with a compression capability that is substantially beyond that of the prior generations of such standards, and the second is for this technology to be highly versatile for effective use in a broadened range of applications than that addressed by prior standards. Some key application areas for the use of this standard particularly include ultra-high-definition video (e.g., with 3840×2160 or 7620×4320 picture resolution and bit depth of 10 bits as specified in Rec. ITU-R BT.2100), video with a high dynamic range and wide colour gamut (e.g., with the perceptual quantization or hybrid log-gamma transfer characteristics specified in Rec. ITU-R BT.2100), and video for immersive media applications such as 360° omnidirectional video projected using a common projection format such as the equirectangular or cubemap projection formats, in addition to the applications that have commonly been addressed by prior video coding standards. This Recommendation was developed collaboratively with ISO/IEC JTC 1/SC 29, and corresponds with ISO/IEC 23090 3 as technically aligned twin text.
- **ITU-T H.266.1 "Conformance specification for ITU-T H.266 versatile video coding"** specifies tests for (non-exhaustive) testing to verify whether bitstreams and decoders meet the normative requirements specified in ITU T H.266 | ISO/IEC 23090-3 "Versatile video coding (VVC)". The bitstreams provided with this document correspond to the first edition of Rec. ITU-T H.266. This Recommendation was developed collaboratively with ISO/IEC JTC 1/SC 29, and corresponds with ISO/IEC 23090-15 as technically aligned twin text.
- **ITU-T H.266.2 "Reference software for ITU-T H.266 versatile video coding"** provides as an electronic attachment reference software for Rec. ITU-T H.266 | ISO/IEC 23090-3 "Versatile video coding" and corresponds to the 2nd edition of Rec. ITU-T H.266. The reference software includes both encoder and decoder functionality. Reference software is useful in aiding users of a video coding standard to establish and test conformance and interoperability, and to educate users and demonstrate the capabilities of the standard. For these purposes, the accompanying software is provided as an aid for the study and implementation of ITU-T H.266 . This Recommendation was developed collaboratively with ISO/IEC JTC 1/SC 29, and corresponds with ISO/IEC 23090-16 as technically aligned twin text.
- **ITU-T H.274 (V2) "Versatile supplemental enhancement information messages for coded video bitstreams"** specifies the syntax and semantics of video usability information (VUI) parameters and supplemental enhancement information (SEI) messages for use with coded video bitstreams. The VUI parameters and SEI messages defined in this Recommendation may be conveyed within coded video bitstreams in a manner specified in a video coding specification or may be conveyed by other means as determined by the specifications for systems that make use of such coded video bitstreams. This Recommendation is particularly intended for use with coded video

bitstreams as specified by Rec. ITU-T H.266 | ISO/IEC 23090-3, although it is drafted in a manner intended to be sufficiently versatile and generic that it may also be used with other types of coded video bitstreams. This Recommendation was developed collaboratively with ISO/IEC JTC 1/SC 29, and corresponds with ISO/IEC 23002 7 as technically aligned twin text.

246. During WTDC-14 Digital broadcasting has been identified as one of the regional initiatives in several regions, and ITU members have recognized the importance of managing the transition smoothly. ITU, in cooperation with Korea, Japan, and Australia, has provided assistance on Digital Broadcasting Transition with updating Guidelines for roadmap development for world-wide, and developed roadmaps for Afghanistan, Fiji, Indonesia, Lao PDR, Solomon Islands, Vietnam, Vanuatu, Guyana, Gabon, Democratic Republic of the Congo, Equatorial Guinea, Bangladesh, Pakistan, Micronesia, Samoa, Myanmar, Timor-Leste, Kiribati, Tonga, Bhutan and Nauru.

247. Also, in cooperation with the Latin-American Development Bank (CAF), ITU provided support to 8 countries (Bolivia, Dominican Republic, Venezuela, Costa Rica, Panama, Colombia, Paraguay and Jamaica) in the Americas Region and translated the guidelines into Spanish.

248. In addition, 5 other countries in Latin-America were assisted within the BDT Operational Plan.

249. Within the framework of the ITU-Latin-American Development Bank (CAF), a summary report on the digital broadcasting roadmaps, which includes 12 countries, has been prepared.

250. Case studies on the experiences in digital terrestrial television broadcasting transition for Thailand, Japan and Australia have been prepared. Also a report was prepared on the Interactive Multimedia Services and Pay TV in ASP.

251. Several workshops were delivered on the subject together the BDT and the BR all around the world. On 17 June 2015, on the date of the analogue switch-off in UHF bands in Region 1, ITU organized a Symposium on the Digital Broadcasting Transition.

252. ITU participated in the EBU (2016 June) and ABU (2015 October) Technical Assembly meetings.

253. ITU-ABU organized Pacific Media Partnership Conference 2015: Partnering for Broadcasting, Apia Samoa, 25-27 August 2015, Apia, Samoa (50 participants from 20 countries)

254. Regional Seminar for Europe and CIS on "Spectrum Management and Broadcasting was held with around 70 participants" in Rome on 29-31 May 2017. In 9 sessions, 45 presentations were delivered on, among others, the Future of digital terrestrial television broadcasting, Digital dividend utilisation, IMT 2020 (5G), Spectrum needs of IoT, etc.

255. ITU developed and is maintaining a database for following the transition from analogue to digital terrestrial television broadcasting:

http://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Pages/DSO/Default.aspx

256. ITU Membership outreach:

257. ITU-R Outreach activities include the information and assistance to membership, the publication of ITU-R outputs and their dissemination, the organization of, and the participation in, seminars and workshops, and the development and maintenance of communication and promotion tools. The purpose of these activities is to ensure that the outputs produced by the ITU-R Sector (regulations, recommendations, reports and handbooks) are disseminated worldwide and familiar to the ITU membership and to stakeholders of spectrum, and that they form the basis for the formulation of spectrum management policies and decisions and for the use of radiocommunications in general. To carry out these activities, the BR relies on close cooperation with the other Bureaus and Sectors, the ITU regional and area offices and the relevant international organisations and national authorities. Recently approved ITU-R outputs are available here: https://www.itu.int/dms_pub/itu-r/oth/0a/0e/R0A0E0000E80001PDFE.pdf

258. Member States of ITU and Sector Members participate actively in the work of the Radiocommunication Sector. Since its opening to the private sector, the ITU membership represents a cross-section of the industry, from the world's largest manufacturers, carriers, operators and system integrators to small, innovative players of the new information and communication technology field.

    Current members include:

    - 193 ITU Member States, which constitute the Union, set its mandate and contribute to the work of ITU as a whole;
    - Around 900 ITU Sector Members, Regional and International Organisations, and Academia (which participate in the work of a defined Sector (R, T or D)) and ITU Associates (which work within the framework of a specific Study Group). These include operating agencies, scientific or industrial organizations, financial and developmental institutions, other entities dealing with telecommunication matters, regional and other international telecommunication, standardization, financial or developmental organizations;

259. In its efforts to ensure the widest participation in the enhancement of worldwide communications and that the interests of all stakeholders are taken into consideration, ITU encourages new entities and organizations to join the Union as Sector Members or Associates. In addition, ITU seeks to further develop intellectual cooperation with educational institutions and universities.

Action Line C10: Ethical dimensions of the Information Society

Related to the SDGs: SDG 1, SDG 2, SDG 3, SDG 4, SDG 5, SDG 8, SDG 9, SDG 10, SDG 11, SDG 12, SDG 13, SDG 16, SDG 17.

260. UNESCO organised a WSIS Action Line C10 session “High-level interaction on implementing ethical AI globally” on Thursday, 2 June 2022. The session aimed at taking stock of where we are and how to move forward with the tools that we have and that are about to be

developed. Speakers shared their perspectives on what these tools should look like and encompass to make sure that developments in AI technologies do not create new forms of exclusion and inequalities and that countries have capacities to harness and justly distribute the benefits on a global level. Details of the session are available here.

261. The WSIS Prizes 2022 Winner for the Action Line C10 is **Apprise Audit**, China. Details of the project are available here.

Action Line C11: International and Regional Cooperation

262. The Action Line C11 Facilitation Meeting was held on Monday, 30 May 2022 together with the Action Lines C1 and C7:E-Government. The title of this session was "Creating synergies and partnerships on e-government between national and local levels".

263. The WSIS Prizes 2022 Winner for the Action Line 11 International and Regional Cooperation is **ASEAN Data Management Framework and Model Contractual Clauses for Cross Border Data Flows**, Singapore. Details of the project are available here.

264. Healthy liaison has continued between ITU R Study Groups and other organizations, with due reference to Resolution ITU R 9, where required. The Bureau continued to maintain close cooperation with international and regional organizations with the following objectives:

    1) promote dialogue amongst bodies having common interests;

    2) improve coordination leading to more effective preparation for events such as WRCs; and

    3) keep ITU R abreast of relevant activities in other organizations for a more strategic planning of work programmes.

265. The Bureau continues its close collaboration with:

- international and regional organizations dealing with the use of spectrum, including the Regional Telecommunication Organizations recognized by the ITU for regional coordination (APT, ASMG, ATU, CEPT, CITEL and RCC); broadcasting organizations (ABU, ASBU, EBU and HFCC); and those focused on the use of specific radiocommunication systems and services (e.g., ITSO, ESOA, GSMA).

- 3GPP and IEEE, as well as several regional standardization organizations, given their importance and relevance to the work of ITU-R Study Group 5. Other notable areas of liaison with Study Groups activities include those with the World Meteorological Organization (WMO), the World Health Organization (WHO), ISO and IEC (including CISPR).

- the International Maritime Organization (IMO), the International Mobile Satellite Organization (IMSO), Bureau International des Poids et Mesures (BIPM), the International Telecommunications Satellite Organization (ITSO), COSPAS-SARSAT, the International Committee of the Red Cross (CICR), the International Civil Aviation Organization (ICAO) with regard to the application of ITU treaty texts. BR experts also participated in various meetings of these organizations.

(d) WSIS Implementation at the Regional Level

266. In the outcomes of the UN General Assembly overall review on the implementation of the World Summit on the Information Society (WSIS) (GA Resolution A/70/125), regional commissions are invited to coordinate the implementation of the WSIS at the regional level.

267. UN Regional Commissions are working towards Regional WSIS Implementation and Review at the Regional Level. ECA is the current chair (2022-2023) for the WSIS-UN Regional Commissions.

268. ESCAP adopted its resolution 72/10, mandating the ESCAP secretariat to support the member States and relevant stakeholders in the implementation of the WSIS action lines, and in particular, to hold a regional review of the implementation of the Summit action lines as part of the session of the Committee on Information and Communications Technology, Science, Technology and Innovation; and coordinate United Nations agencies and partners in the regional review and follow-up towards harmonized approaches in the implementation of the Summit.

269. The WSIS Regional Review for Asia and the Pacific meeting was held on 29 August 2022 in Bangkok, Thailand. The meeting highlighted the implementation of the WSIS Action Lines in the region for the achievement of the SDGs.

270. ESCWA and the League of Arab States (LAS) organised the Consultative Conference on the Arab Digital Agenda and the Arab International Digital Cooperation and Development Forum from 25 to 27 October 2022. The Forum included the first preparatory meeting of the Arab International Digital Cooperation and Development Forum 2023, comprising the fourth Arab High-level Forum on the World Summit on the Information Society and 2030 Agenda and the seventh conference of the Arab Internet Governance Forum.

(e) United Nations Group on the Information Society (UNGIS)

271. UNGIS was endorsed by the CEB in April 2006 and it serves as an interagency mechanism to coordinate substantive policy issues facing the United Nations system's implementation of the Geneva Plan of Action and Tunis Agenda for the Information Society adopted by the World Summit on the Information Society, thereby contributing to improving policy coherence in the UN system, as requested by the 2005 World Summit.

272. ITU took over the Chairmanship of UNGIS for period 2022-2023. The Vice-Chairs are UNESCO, UNCTAD, UNDP, and UN ECA.

273. At the request of its members, UNGIS has initiated the repository of projects by UNGIS members on digital transformation that will be used as a reference guide and repository for UN Agencies to display different implemented initiatives/activities showing the direct impact of the WSIS Action Lines on SDGs.

274. ITU continues to provide secretariat support to UNGIS and maintains the official UNGIS webpage www.ungis.org.

275. UNGIS events:

a) STI Forum 2022 Side Event: ICTs for Well-Being, Inclusion and Resilience: WSIS Cooperation for Accelerating Progress on the SDGs

b) Side Event @ Hlpf 2022: ICTs for Well-Being, Inclusion And Resilience: WSIS Cooperation For Accelerating Progress on the SDGs

c) UNGIS Side Event At The African Internet Governance Forum 2022: WSIS Action Lines for Achieving the SDGs

(f) Measuring the Information Society (Para113-119 of TAIS)

276. In 2021-2022, more than 180 statistical indicators from over 200 economies worldwide were collected through five annual questionnaires. The data were disseminated through the ITU website, ITU DataHub (an online portal), Digital development dashboard, printed publications such as the Global Connectivity Report, the Measuring Digital Development: Facts and Figures, and electronic download and USB-key of the 26th (July 2022) edition of the World Telecommunication/ICT Indicators database (WTID), available for both Windows and Mac users.

277. ITU is an active member of the Partnership on Measuring ICT for Development[5] and one of the three members of its Steering Committee, together with UNCTAD and UN DESA. The Partnership has been very active in tracking the progress of the WSIS Targets, has made a concerted effort to highlight the role that ICTs will play in achieving the SDGs and has taken a lead role in increasing awareness about the importance of ICT for development and in international ICT monitoring. The Partnership has developed a core list of ICT indicators as well as associated statistical standards and methodologies, in close consultation with experts from National Statistical Systems. The core list, which has been endorsed by the United Nations Statistical Commission, provides the basis for the production of ICT statistics in countries all over the world.

278. The Partnership presented the report "Partnership on Measuring ICT for Development: Information and communication technology statistics (E/CN.3/2022/21)" at the 53rd Session of the UN Statistical Commission (UNSC) that was held in New York on 1-4 March 2022. The report included the revised core list of indicators and highlighted the need to implement the revised guidelines with a view to improving the availability and quality of

[5] The Partnership on Measuring ICT for Development is an international, multi-stakeholder initiative that was launched in 2004 to improve the availability and quality of ICT data and indicators, particularly in developing countries. The Partnership has guided policy makers in producing ICT statistics that are crucial to informed decision-making, including through the identification of a core list of ICT indicators and methodologies to collect these indicators. The Partnership helps developing countries collect ICT statistics, particularly through capacity-building and hands-on training for national statistical offices, and collects and disseminates information society statistics. Its membership has grown from originally 11, to today 14 regional and international organisations: ITU, UNCTAD, UNDESA, UNESCO Institute for Statistics (UIS), ILO, UNEP-SBC, UNU-ViE SCYCLE, World Bank, UNECA, UNECLAC, UNESCAP, UNESCWA, EUROSTAT and OECD.

indicators on information and communications technology (ICT) and better assessing the digital readiness to face crises such as that caused by the coronavirus disease (COVID-19).

279. The Partnership is actively engaged in monitoring the Sustainable Development Goals. The 2030 Agenda for Sustainable Development recognizes that "the spread of information and communications technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies". Several SDG targets refer to ICTs and technology, highlighting the need to include specific ICT indicators in the monitoring framework. Nevertheless, in the global SDG indicator framework, which helps to monitor progress, identify challenges, and guide policy makers, out of 231 only 7 ICT indicators are included, covering 6 targets under Goals 4, 5, 9, and 17. Five of the seven indicators are collected and disseminated by the ITU.

280. The Partnership has also developed a thematic list of ICT indicators that could be used to measure ICT availability and use in sectors relevant to the SDGs that are not covered in the global SDG indicators framework. This list was presented during the 2019 WSIS Forum, and finalized after the WSIS Forum 2019, upon receiving feedback from stakeholders. The list was endorsed by the UN Statistical Commission in its 51st session.

281. During the WSIS Forum 2022, the Partnership organised a session on "Exploring the use of innovative data sources", that was held on 2 June 2022. This session covered presentations on the use of Artificial Intelligence in government, mobile phone big data use applications and five principles for maintaining trust in this innovative data source, as well as a discussion on scanner data or web scraping (for business statistics). These innovative data sources have the potential to make an important link in the data ecosystem within both the public and private sectors, alongside traditional forms of data sources.

282. The 13th Meeting of the Expert Group on Telecommunication/ICT Indicators (EGTI) and the 10th Meeting of the Expert Group on ICT Household Indicators (EGH) took place back-to-back in virtual format, from 13 to 15 September 2022. 242 participants from national statistical offices, ministries, regulators, international and regional organizations, and the private sector attended these meetings. The topics that were discussed during the EGH meeting included a report of the subgroup on e-waste indicators in household surveys, a report of the subgroup on the development of indicators measuring OTT services (jointly with EGTI), a report of the subgroup on skills to aggregate the skills categories and a review of the household long questionnaire. The topics that were discussed during the EGTI meeting included a report of the subgroup on the implications of 5G deployment on measuring M2M subscriptions, a report of the subgroup on the development of indicators measuring OTT services (jointly with EGH), a review of the indicators collected in the ITU WTI Long Questionnaire and the outcome of the discussion in the EGTI forum on measuring the Internet of things (IoT).

283. The **17th World Telecommunication/ICT Indicators Symposium (WTIS)** took place in virtual format from 1 to 3 December 2020. The theme of the WTIS-20 is ”Towards an inclusive digital society”, and featured high-level debates relevant to the theme of the symposium. The work of the Expert Group on Telecommunication/ICT Indicators (EGTI) and the Expert Group on Household Indicators (EGH) was presented for adoption by WTIS-20.

284. The 2020 edition of **Measuring Digital Development: Facts and Figures** was launched during the 17th World Telecommunication/ICT Indicators Symposium. The publication offered a snapshot of the most important ICT indicators, including estimates for the current year.

285. The 2021 edition of **Measuring Digital Development: Facts and Figures** is available here**.**

(g) Maintaining the WSIS Stocktaking Database (Para 120, Tunis Agenda) and a portal for best practices and success stories (Para 28, Geneva Plan of Action).

286. The WSIS Stocktaking process has been maintained by ITU since 2004 as requested by the WSIS Outcomes (TAIS, Para 120). This **publicly accessible WSIS Stocktaking database** (www.wsis.org/stocktaking), currently with more than 14,000 entries and a growing community of 450.000 stakeholders, is a unique global tool for collecting information and regular reporting on information and communication technology related initiatives and projects, carried out by governments, international organizations, the private sector, civil society, academia and other entities, in the context of 11 WSIS Action Lines.

287. In 2015, the UN General Assembly within the framework of the ten year review of the WSIS (Res. A/70/125) called for a close alignment between the WSIS process and the 2030 Agenda for Sustainable Development (Res. A/70/1). The WSIS Stocktaking process responded by highlighting the contribution of 11 WSIS Action Lines to the achievement of 17 Sustainable Development Goals (SDGs).

288. The United Nations Economic and Social Council ECOSOC Resolution 2020/12 on "Assessment of the progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society" reiterates the importance of sharing best practices at the global level, and, while recognizing excellence in the implementation of the

projects and initiatives that further the WSIS goals, encourages all stakeholders to submit ICT-related projects and initiatives to the WSIS Stocktaking platform.

289. ITU is pleased to invite you to update and submit new entries online at www.wsis.org/stocktaking. Submitted activities were reflected in the **WSIS Stocktaking Report 2022**, that was released at the WSIS Forum 2022.

(h)Emergency Telecommunications (Para 91 of TAIS)

BDT events

1. BDT and the United States Telecommunication Training Institute (USTTI) jointly organized a public webinar on *"Building Disaster Resilience through Emergency Telecommunications"*. This webinar which took place on 15 and 16 December 2020, from 9h00 to 12h00 EST (15h00-18h00 CET), highlighted the role of emergency telecommunications for disaster risk reduction and management, and discussed best practices for increasing ICT resilience and capacity for saving lives and limiting the impact of natural and manmade hazards, including pandemics. This event was attended by over 100 participants from all over the world on both days.

2. During a virtual event that took place the 20th of January 2021, the Emergency Telecommunications Division launched three new online training modules *to* allow ITU to build capacity and increase knowledge on the topic of emergency telecommunications and to continue to build disaster resilience, even in times of the current pandemic. These modules cover the development of NETPs (based on the ITU Guidelines on NETPs), guidelines on organizing tabletop simulation exercises (based on the guide jointly developed with ETC) and information on the Tampere Convention and its benefits. The online event was attended by 162 participants from all over the world. **By 04 Oct. 2021, the number of participants that have taken the courses were the following: TTX = 143; 23 have earned the badge. Tampere = 147; 49 have earned the badge. NETPs = 293; 84 have earned the badge.**
3. BDT organized an online event to highlight the key findings indicated in the report *Women, ICT and Emergency Telecommunications: Opportunities and Constrains*. This event took place on the 8th of March 2021 and brought together different experts who discussed how closing the digital gender divide can help to save more lives when disasters or emergencies strike.
4. As part of the WSIS 2021 Action Line C7 on e-environment, ITU jointly with WMO organized a session on "Innovation in Data and Technology for Climate Action", which took place on the 23 April 2021. This session highlighted that data along with technology are some of the most important tools to combat climate change and for helping countries to face extreme weather events which cause disasters. It showcased innovative examples from WMO, private sector companies and ITU on how data and technology are being applied for climate action and disaster risk reduction. The session took place on 23 April 2021.
5. During the World Summit on the Information Society 2021, ITU in partnership with UNDRR, WMO and WBU, organized a High-Level Dialogue on "Disaster Risk Reduction Media Hub", a toolkit for news media professionals reporting on disasters and resilience, which took place on the 26 April 2021. The session emphasized the role and capacity of TV and radio technologies as the most trusted sources of information, and highlighted the crucial role that broadcast media organizations play in the early warning chain to deliver accurate and timely early warning messages to end-users before disasters strike. Panel discussions examined the

importance of having access to safety information early enough and prior to a disaster, and the critical role that ICTS play in delivering early warnings and alerts. Panelists highlighted that collaborative efforts made by different agencies and stakeholders can accelerate action for saving lives and livelihoods.

6. On the 29th April 2021, during the Humanitarian Networks and Partnerships Week, ITU together with IFRC and WMO announced the Call to Action on Emergency Alerting. The goal is that all countries, by 2025, are able to enhance their emergency alerting by leveraging the Common Alerting Protocol (CAP). CAP is the international (ITU) standard format for exchanging all-hazard emergency alerts and warnings over all kinds of networks, including digital media. With increased risks of extreme weather and disasters, the public needs to have an even greater awareness of the risks they face. Information shared at the right time, in an understandable format, by trusted sources, can be the most effective life-saving tool in the event of an emergency. Early warning systems have improved over the years, but people continue to perish and suffer from hazard threats because, too often, early warning messages arrive too late, are not understandable enough, or do not provide clear guidance. The adoption of CAP is an important step for better disaster management.
7. On July 6th, EET partnered with ITU-TSB's Focus Group on AI for Natural Disaster Management (FG-AI4NDM) to host a 60-minute session during the Emerging Technology for Connectivity week (5 to 9 July 2021). Speakers included senior representatives from ITU-BDT, ITU-TSB, WMO, WFP, and the University of Oregon. This session, attended by over 140 participants, discussed new applications of emerging technology, or novel use of existing technology, in the context of ICTs for disaster management. The event presented a number of initiatives that use emerging technologies to advance disaster forecasting and response, including AI and ML, drones, satellites, big data, and 3D printing, with particular focus on least developed countries (LDCs), landlocked developing countries (LLDCs), and small island developing states (SIDS). The session also introduced the concept of a new repository of case studies and subject matter experts that ITU would like to build to connect relevant stakeholders from industry, the public sector, and academia.
8. The ITU Arab Regional Office in collaboration with the Telecommunications Regulatory Authority (TRA) of the Sultanate of Oman organized a training workshop on the Common Alerting Protocol (CAP) that took place on the 7th of July, 2021. The workshop highlighted the benefits of using the Common Alerting Protocol (CAP) as an ITU standard for exchanging all-hazard emergency alerts and public warnings over all kinds of ICT networks and enable national authorities to deliver early warnings and alerts to all people and communities at risk in a timely manner. The workshop was attended by over 110 participants from Oman's ICTs sectors, national disaster committee, national NGOs, meteorological organizations, public and private sector involved in disaster management in Oman, including academia. Once again, the number of participants that were able to join the virtual workshop from different parts of Oman, shows the benefits of moving to virtual meetings. Virtual gives the opportunity for more people to benefit from this type of trainings as no travel needs to take place.
9. The ITU America's Regional Office, in collaboration with EET Division, organized a Regional Workshop on the use of ICTs for disaster management and risk reduction, which took place from 14 to 16 September 2021. This event presented and discussed how ICT solutions and digital technologies can be used for disaster management and risk reduction in the region, the importance of National Emergency Telecommunication Plans, the value of the Tampere Convention, the benefits of emerging technologies for risk reduction, as well as early warning for early action, the role of simulation exercises and the importance of gender inclusion on

the use of ICTs for disaster management. During the workshop, participants and speakers had an opportunity to exchange experiences, views and best practices on the use of modern technologies for humanitarian purposes. The regional event was provided in Spanish & English and had 68 participants from the region.

ITU's support to develop NETPs

10. BDT continues aiding the following countries to develop their NETPs: Afghanistan, Saint Lucia, Somalia, Sudan, Solomon Islands, Ecuador, Peru and Dominica and Grenada. Countries that have requested assistance on the development of the plans are Fiji, Kiribati, and Tonga. NETPs that have been concluded are Guatemala, Bolivia, Vanuatu, Samoa, and Papua New Guinea. Several online meetings have been organized with national stakeholders in order to ensure that the plans are developed through a multi-stakeholder approach involving different organizations working on disaster management, such as the national disaster management authorities, meteorological and hydrological organizations, humanitarian entities, ICT government and private sector, academia, civil society and customs authorities. This will guarantee that the plans are developed based on each countries' real needs.
11. To further support countries in developing NETPs, ITU started to undertake baseline assessments, which will help to identify the availability of national laws, regulations and policies governing emergency telecommunications within the Arab, Pacific Islands and Americas Member States. The ongoing assessments will also help to track ITU's Strategic Goals and in particular the Target 3.5, which reads: By 2023, all countries should have a National Emergency Telecommunication Plan as part of their national and local disaster risk reduction strategies; assess the levels of maturity and preparedness for each country in terms of the resilience of the telecommunication sector and the way it can support the countries' disaster risk reduction and management efforts. So far, two assessments have been concluded, Bahrain and Perú. These assessments are based on a template that was developed for this task.

ITU's Disaster Response

12. ITU provided support to the Government of Haiti after the devastation caused by a 7.2 magnitude earthquake that struck the county on 14 August 2021, by providing 20 satellite phones and 10 Broadband Global Area Network (BGANs) terminals. This equipment is currently being used by national humanitarian first responders to help communities that were severely impacted with recovery and reconstruction efforts. During this emergency, ITU and the Emergency Telecommunications Cluster (ETC) also used the Disaster Connectivity Map (DCM) to assist planning for the response efforts and determine connectivity gaps in the impacted areas. DCM is a mapping platform to help first responders determine the status of telecommunications network infrastructure, coverage, and performance before and after a disaster. Since the earthquake, the DCM mapped over 12,000 connectivity data measurements and compared them to baseline measurements to find gaps that can be filled with emergency telecommunications, saving lives and connecting the people affected by this deadly event.

Disaster connectivity map

13. The Disaster Connectivity Map (DCM) was built in 2020. The DCM is a joint initiative between ITU and Emergency Telecommunications Cluster (ETC) and input from GSMA, which consists of a live map that can provide information on the type, level, and quality of connectivity available on the ground during times of disasters. In December 2020, the DCM prototype was implemented and hosted onto an upgraded ITU web server with defined access control restrictions on third party DCM content based on different data licensing, rights and permissions. ITU and ETC have tested the DCM twice in the last six months, once in Fiji and once in the Caribbean. The first test was in response to cyclone Yasa, which flattened entire villages as it tore through Fiji in mid-December 2020. In this case, the DCM was used to compare baseline data and ICT infrastructure data to actual connectivity measurements during the event to estimate which cell sites and other ICT infrastructure were online and which might be offline while power was restored, and which areas may be offline longer term. Based on this, and in conjunction with broader coordination efforts, ETC worked with partners in the region to supplement communications gaps with additional satellite equipment in the short term, and for work on temporary cell sites to fill gaps while longer term recovery was in progress. The second test was in response to the La Soufriere volcano, situated on the main island of St. Vincent and the Grenadines. On April 9th 2021, an explosive eruption occurred, forming a plume of volcanic ash that affected St. Vincent as well as neighboring islands including Barbados. Based on requests to confirm internet outages, we started a connectivity measurement campaign from April 15th through April 22nd, where we collected over 32,000 connectivity measurement datapoints and updated the DCM at hourly intervals. When analyzing these measurements compared to baseline connectivity data, we observed short-term geographic outages during the event that were restored by the end of the campaign.

Emergency Telecommunications Roster

14. To respond to the increasing demand for support in delivering emergency telecommunication equipment and services when disasters strike, the ITU has established an internal emergency telecommunication roster . Suitable ITU staff has been selected and are being trained on the deployment process and use of the current (and future) ITU telecommunication equipment. So far, the roster staff has received trainings on travel safety and personal security, social media in crisis situations and how to write impact stories. This team is also being trained to support the Emergency Telecommunications Cluster work on the ground, by liaising with national authorities and stakeholders on importation and licensing requirements of telecommunication equipment.

Collaboration with other UN entities

15. ITU contributed to a training project on Early Warning Systems for broadcasters. This project is a special collaboration between UNDRR, WMO, IOC-UNESCO and EBU, and focuses on using public service broadcasting technologies, such as TV and radio, to deliver early warning alerts to communities at risk. The purpose of this project is to train broadcasters on disaster management and on reducing risks by sending the correct message for impending hazards to end users. This project is already ongoing, and from December 2020 to April 2022, there are 36 training sessions that have been schedule in 29 countries, involving 46 organisations and

more than 675 media professionals. Training sessions taking place: 10 in Africa , 16 in Asia Pacific, 10 in Caribbean. So far, trainings have been delivered in Caribbean and Asia Pacific.

16. ITU is working very closely with WMO and IFRC to participate in the Expert Team on the Global Multi-hazard Alert System Framework (ET-GMAS). GMAS is a framework for substantially increasing and enhancing the availability of authoritative warnings and information related to extreme and/or potentially high-impact weather, water and climate events – regionally and globally. Several meetings have been organized and a concept note to include the component of early warning systems is in the process of being finalized.

17. On 29 April 2021, ITU along with the International Federation of Red Cross and Red Crescent Societies (IFRC) and the World Meteorological Organization (WMO) endorsed the "Call to Action on Emergency Alerting", which states that by “2025 all countries have the capability for effective, authoritative emergency alerting that leverages the Common Alerting Protocol" . So far, 12 other organizations have also endorsed the call to action.

18. As a follow up activity to the Call to Action on Emergency Alerting, ITU along with the International Federation of Red Cross and Red Crescent Societies (IFCR), is supporting the World Meteorological Organization (WMO) to establish a CAP HelpDesk, which aims at supporting country level implementation of CAP through information, methods, and tools to inspire coordination and build a community of support to scale CAP implementation worldwide. Moreover, it will serve as an important contribution to WMO's ongoing Global Multi-hazard Alert System (GMAS) development, where ITU is also part of.

(i) International Internet Connectivity (Para27c.ii and 50d of TAIS)

290. ITU-T Study Group 3 continues to study this subject through its current work items. BDT is providing assistance to East African Community (EAC) and South African Development Community (SADC) countries on the creation of national Internet Exchange Points (IXPs) and achieving efficient and cost effective Regional Internet connectivity.

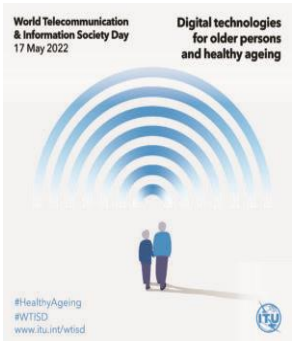
291. ITU-D Study Group 1 Question 1/1 within its work items for the 2014-2017 study period studied some of the existing resources available, including case studies received, related to the deployment of Internet Exchange Points (IXPs) with an aim to prepare best practice guidelines that may be useful for the Member States. As an example, an empirical study of Kenya and Nigeria assessing the impact of IXPs in these two Sub-Saharan countries has been considered. The Group examined how IXPs can be used to improve connectivity, how they can improve the quality of Internet services provided and potentially save operators money in connectivity fees. Other contributions to the work of the Group looked at the critical cost and performance benefits of IXPs in countries in the Americas (Argentina, Brazil, Colombia and Ecuador), and how they have been able to advance Internet growth in this region.

(j) World Telecommunication and Information Society Day

292. World Telecommunication Day has been celebrated annually on 17 May since 1969, marking the date of the signing of the first International Telegraph Convention and the founding of ITU in 1865. It was formally instituted by the Plenipotentiary Conference in Malaga Torremolinos in 1973. In recognition of ITU as the lead United Nations agency for telecommunications and information and communication technologies, the World Summit on the Information Society in Tunis, November 2005, called on the United Nations General Assembly to proclaim 17 May as World Information Society Day (see paragraph 121 of the Tunis Agenda).

293. On 27 March 2006, the United Nations General Assembly adopted Resolution 60/252, proclaiming 17 May as World Information Society Day to focus global attention annually on bringing the enormous benefits of the digital revolution in ICTs to the world's inhabitants.

294. The ITU Plenipotentiary Conference in November 2006 welcomed the General Assembly's decision and amended Resolution 68 to invite the Council to adopt a specific theme for each World Telecommunication and Information Society Day.



295. The theme for WTISD-2022, "Digital technologies for older persons and healthy ageing", reflects a defining demographic trend of the 21st century. More than a billion people around the world are currently aged 60 years or older. Amid the overall ageing of the global population, ITU is promoting digital solutions as a key element in the UN Decade of Healthy Ageing. The event highlighted the role of ICTs to play in achieving healthier ageing, but also in helping people build smarter cities, combat age-based discrimination at the workplace, ensure financial inclusion of older persons, and support millions of caregivers across the world. More details are available here: https://www.itu.int/en/wtisd

296. WTISD-2022 took place in a hybrid format during the WSIS Forum 2022. The event brought together ITU members and partners to raise awareness of the benefits technology can bring to older person and the process of healthy ageing.

(k) Bridging the standardization gap (BSG)

297. The BSG Programme is centred around five pillars in line with governing texts, such as PP Resolution 123 (Dubai, 2018) and Resolution 44 (Rev. Geneva, 2022). The five pillars of the BSG programme are as follows: Engagement, Know-how, Community, Awareness, and Partnering. The objective of the BSG programme is to empower participation and informed dialogue in standards-making from all corners of the world. Empowered participation raises the international acceptance and quality of ITU-T standards and ensures their wide implementation.

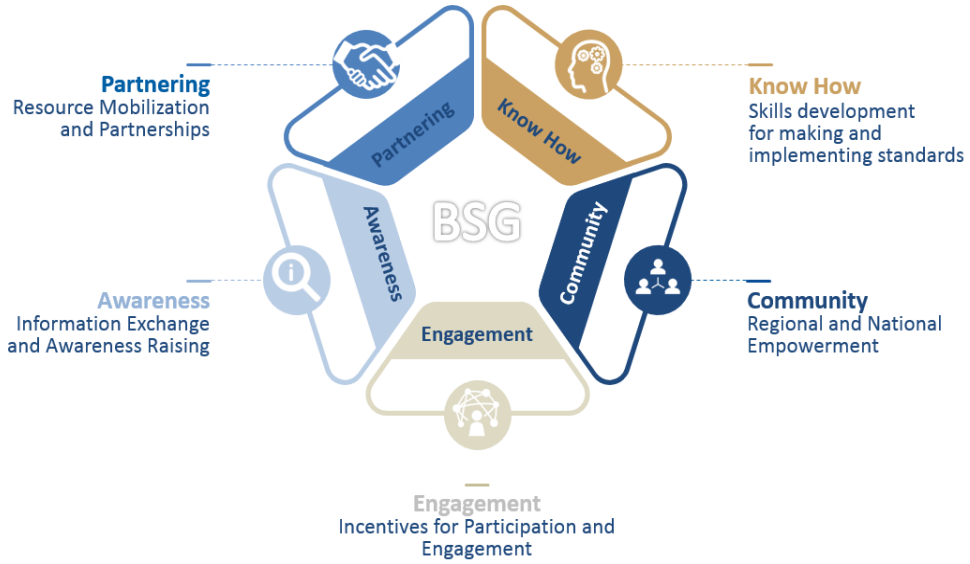


Figure 1: Pillars of the BSG programme

298. ***BSG Engagement*** is directed towards facilitating participation from developing countries in the standards development process. This includes fellowships, mentorship programmes and tools for remote participation.

299. ITU-T Study Group Mentors are very important when it comes to helping newcomers settle in and leave no questions unanswered. The 11 ITU-T Study Groups have already some 20 mentors.

300. Remote participation efforts continue to be enhanced and fellowships are provided to support participation in the work of ITU-T Study Groups and their regional groups.

301. BSG Know-how covers the development of skills and capabilities for standards-making. This includes standards-making effectiveness sessions (BSG hands-on sessions), video primers and e-learning courses.

302. The successful hands-on capacity-building training conducted by ITU T SG3 since early 2014 has been extended to other study groups and their regional groups. These BSG Hands-On sessions are geared towards assisting developing countries in acquiring the right skills and capabilities for international standards-making and to draft contributions for meetings. The sessions focus on the development of practical skills to maximize the effectiveness of developing countries' participation in the ITU-T standardization process, covering topics including strategies for participation in Study Groups, drafting Contributions, presenting proposals, collaborative working methods and means of gaining support and building consensus.

303. These BSG training sessions have welcomed 104 delegates in first quarter of 2021. Considering the shift to fully virtual ITU-T meetings in response to COVID-19, 12 virtual BSG training sessions have been organized since May 2020 and additional trainings are being planned for the remaining quarter of 2021.

304. ***BSG Community*** is dedicated to empowerment for standardization, both at the regional and national level. A key example under ***BSG Community*** are the regional groups of ITU-T

study groups, which ensure that standards-making is inclusive of the needs of all regions. Celebrations of the 50th anniversary of ITU-T regional groups were held in February 2018 during the SG3RG-AFR meeting. SG3RG-AFR is among the first ITU-T regional groups to be created back in 1968, together with three other regional groups of SG3.

305. Activities under the pillar BSG Awareness aim to promote information sharing and exchange, through for instance, ITU-T publications on a wide range of topics and Regional and Inter-regional Standardization Forums.

306. Since 2016, a new strategy was adopted for Standardization Forums. These are now fully in line with the priorities of ITU-T study groups, and are mainly held in coordination with ITU-T regional groups. Raising awareness of standards activities is also made possible through the participation of key decision makers (including prime Ministers, Ministers, Head of Regulators etc.) and good media coverage. The following events were held since November 2020:

- Eighth SG13 Regional Workshop for Africa "Standardization and Future Networks: Opportunities for Africa beyond 2020", virtual, 1 June 2021.
  - ITU-T SG13 developed: **ITU-T Technical Report TR-BSG "Use of ITU-T Recommendations by Developing Countries"**: A standard is defined as a document established by consensus and approved by a recognized body. In the UN, the ITU-T is the recognized body for Telecommunication Standardization whose output Standards are known as ITU-T Recommendations. Countries use standards to maximize compatibility, interoperability, safety, repeatability, and quality among others. The ITU-T standardization process involves its members in the development of the standards, which they later utilize. The development of any standard is motivated by a present need to solve a problem or a future need to solve future problems. The expectation is that all countries on either side of development, to actively participate in both the production and utilization of the standards. There is however a perception that there is less utilization of the ITU-T standards by Developing Countries. This document presents the analysis and interpretation of the results of the questionnaire on use of ITU-T Recommendations in Developing Countries.

307. **Free on-line access to ITU-R Publications for bridging the standardization gap**

The ITU free online access policy continues to provide a very large dissemination of ITU standards to a broader public, especially in developing countries with financial and technical constraints. This wide outreach via free online access is helping to build the visibility of ITU's mission and mandate and reinforce ITU as a global telecommunication authority.

By Decision 12 (Guadalajara, 2010), PP-10 adopted a free online access policy to include, inter alia, ITU-R Recommendations and Reports. This policy was expanded by Council 2012 Decision 571, revised by Council 2013 and 2014 , and confirmed by PP-14 revised Decision 12, which provides free online access for the general public, on a permanent basis, to ITU-R, ITU-T and ITU-D Recommendations and Reports; ITU-R handbooks on radio-frequency spectrum

management[6]; ITU publications concerning the use of telecommunications/ICTs for ensuring disaster preparedness, early warning, rescue, mitigation, relief and response; the International Telecommunication Regulations (ITRs); the Radio Regulations; the Rules of Procedure; the basic texts of the Union (Constitution, Convention, General Rules of conferences, assemblies and meetings of the Union, decisions, resolutions and Recommendations); the final acts of plenipotentiary conferences; the final reports of WTDCs; the ITU Council resolutions and decisions; the final acts of world and regional radiocommunication conferences; and the final acts of world conferences on international telecommunications.

ITU-R Recommendations

The ITU-R Recommendations constitute a set of international technical standards developed by the Radiocommunication Sector (formerly CCIR) of the ITU. More details are available online: https://www.itu.int/pub/R-REC

ITU-R Reports

Free online access to all current ITU-R Recommendations & Reports is available at: https://www.itu.int/pub/R-REP

Navigation and analysis tools for ITU-R electronic publications:

Radio Regulations tools: the Radiocommunication Bureau developed software tools to facilitate the use and analysis of the Radio Regulations which is available for subscription and download since the first quarter of 2016 - www.itu.int/pub/R-REG-RRX

ITU-R documents database search tool

The ITU-R documents database search facility was developed to make ITU-R documents (ITU-R Recommendations, ITU-R Questions, ITU-R Reports, ITU-R Resolutions and ITU-R Handbooks) more accessible. It helps to search ITU-R documents by providing search functions and filtering criteria such as document number, radio category, radio service, frequency range and approval year - https://extranet.itu.int/brdocsearch

(I) Internet Governance Forum (IGF)

308. The 16th annual meeting of the IGF was hosted by the Government of Poland in Katowice from 6-10 December, under the overarching theme: Internet United. The IGF 2021 hybrid process featured a preparatory component or phase, which includes build-up sessions on the IGF 2021's issue areas, development of the intersessional work as well as a series of capacity development activities. WSIS organised its first meeting of the WSIS Forum 2022 Open Consultation Process on 8 December 2021 during the IGF 2021. Details of the meeting are available here.

[6] These include the ITU-R Handbooks on National Spectrum Management; Computer Aided Techniques for Spectrum Management; and Spectrum Monitoring.

309. The 17th annual meeting of the IGF, under the overarching theme Resilient Internet for a Shared Sustainable and Common Future, will be held in Addis Ababa, Ethiopia from 28 November to 2 December 2022.

(m) Follow up on the UN Secretary-General's Roadmap for Digital Cooperation

310. In June 2020, the UN Secretary-General released the new Roadmap for Digital Cooperation (A/74/821), which includes a set of recommended actions for the international community to help ensure all people are connected, respected, and protected in the digital era. It builds on recommendations made by the Secretary-General's High-level Panel on Digital Cooperation, and input, received through the eight Roundtable groups convened by the office of the UN Secretary-General, from Member States, the private sector, civil society, and the technical communities and other stakeholder groups.

311. ITU is collaborating with the office of the UN Secretary General, specifically the office of the UN Secretary-General's Special Envoy on Technology in the implementation of the Roadmap on Digital Cooperation. ITU is co-leading two Roundtable groups, namely on Global Connectivity and Capacity Building, together with UNICEF and UNDP, respectively, and participating other Roundtable groups, for rest the subjects, such as Digital Inclusion, Digital Public Goods, Trust and Security, Artificial Intelligence and Digital Cooperation Architecture, to implement and support key actions outlined in the Roadmap.

(IV) Overall Review of the Implementation of the Outcomes of the World Summit on the Information Society

(a) UNGA Overall Review of the Implementation of the WSIS Outcomes

312. Paragraph 111 of the Tunis Agenda, endorsed by the General Assembly in resolution 60/252 , requested the General Assembly to undertake the overall review of the implementation of the outcomes of the World Summit on the Information Society in 2015. In response, the General Assembly in resolution 68/302 , decided that the overall review will be concluded by a two-day high-level meeting of the General Assembly, to be preceded by an intergovernmental process that also takes into account inputs from all relevant stakeholders of the World Summit on the Information Society. Co-Facilitators of the UNGA Overall Review appointed by the President of the UNGA are Ambassador Jānis Mažeiks, Ambassador of Latvia and Ambassador Lana Zaki Nusseibeh, Ambassador of the United Arab Emirates.

(V) Forums, innovative initiatives and future actions

(a) WSIS activities in response to COVID-19

313. The COVID-19 pandemic has accelerated the need for the WSIS Forum to transform and respond, with digitalisation as a key enabler. As part of the effort, WSIS has been actively engaged in promoting the use of ICTs to support achieving the SDGs as well as to respond to such global crises as the COVID-19 pandemic.

314. The COVID-19 crisis has illustrated the power and promise of ICTs for continued functioning of societies. In collaboration and at the request of stakeholders, WSIS

secretariat initiated some initiatives and activities to highlight the full power of ICTs to respond to and recover from COVID-19 pandemic.

a. WSIS TalkX

Since April 2020, at the request of WSIS stakeholders, the WSIS team hosted regular virtual WSIS TalkX for the WSIS Stakeholders to interact, connect and collaborate. Following the highly appreciated weekly sessions at the beginning of this year, the WSIS Forum 2021 featured 100 COVID19-related sessions and this global response of the WSIS community has proven the need to for continuous discussion on challenges the pandemic has put on societies and economies, while highlighting ICT tools as indispensable to continue, recover, and enhance the digital transformation in all segments of life.

The fourth season of the inspirational WSIS TalkX started in September 2021 and conducted with ITU and other WSIS stakeholders, all discussing the impact of COVID-19 and ways to empower our actions with the efficient use of technologies. New series of WSIS TalkX continues to gather new insights on how ICTs are combating the pandemic, and invites the community to take active participation by joining the discussions.

b. The Coronavirus (COVID-19) Response – ICT Case Repository

As a part of the WSIS Stocktaking efforts to promote the innovative use of ICTs, the Coronavirus Response - ICT Case Repository collected more than 500 projects and activities dedicated to responding to the COVID-19 crisis. Second edition of the special ICT Case Repository: The Coronavirus Response is now available here. The WSIS Stocktaking continues to collect ICT projects on a year-around basis, and we invite all stakeholders to continue contributing to this important repository.

c. WSIS Action Lines

Implementation of the WSIS Action Lines have been notably recognized in advancing the SDGs, and are now also being identified as important in responding to the COVID-19 pandemic. In particular, all activities at the WSIS Forum 2022 and WSIS Stocktaking 2022 have been carefully reviewed for linkages between the WSIS Action Lines, SDGs, and the data on COVID-19 was collected from the stakeholders during the submission phases for further analysis and reporting. Stakeholders have been suggesting that an effective implementation of the WSIS Action Lines can help accelerate the achievement of the SDGs, and help combat the COVID-19 crises.

(b) Forums

WSIS Forum 2022 Event and its outcomes:

315. The WSIS Forum builds upon the outcomes of the UN General Assembly Overall Review of the Implementation of the WSIS Outcomes (UNGA Resolution A/70/125) that recognized the necessity of holding this Forum on an annual basis and called for a close alignment between WSIS and the 2030 Agenda for Sustainable Development. In this context, the WSIS Forum leverages on the WSIS-SDG Matrix and serves as a key forum for discussing the role of ICTs as a means of implementation of SDGs, with due regard to the global mechanism

for follow up and review of the implementation of the 2030 Agenda (UNGA Resolution A/70/1). The WSIS Forum is coordinated by ITU and has been co-organized since 2006 by ITU, UNESCO, UNDP and UNCTAD with the engagement of other United Nations Agencies, including WIPO, UNDESA, FAO, ILO, UNIDO, ITC, UNHCR, UNICEF, UNODC, UNEP, UPU, WMO, WHO, WFP, UN Women, UN Regional Commissions.

316. The WSIS Forum 2022 was held from 15 March 2022 onwards in a virtual format and culminated in a final week from 30 May to 3 June 2022 at the ITU Headquarters, Geneva, Switzerland with remote participation. The Forum had over 250 sessions, including thematic workshops, country workshops, WSIS Action Line Facilitation meetings, high-level dialogues, high-level policy sessions, knowledge cafes and open-space talks enabled on-site as well as virtual participants from over 150 countries to engage with more than 500 high-level representatives of the wider WSIS stakeholder community, including Ministers and Deputies, Ambassadors; and Leaders from the Private Sector, Academia and Civil Society. In addition, more than 130 exhibitors highlighting innovation and projects from the ground. 18 WSIS Prizes winners and 72 WSIS Prizes champions were acknowledged for their excellent work in implementation of the WSIS Action Lines on the ground.

317. The Chairman of the WSIS Forum 2022 was H.E. Professor Isa Ali Ibrahim (Pantami), Minister, Federal Ministry of Communications and Digital Economy, Nigeria. Policy Statements were delivered during the High-Level Policy Sessions (31 May – 1 June) of the WSIS Forum 2022 by high-ranking officials of the WSIS stakeholders community, representing the Government, Private Sector, Civil Society, Academia and International Organizations. The High-Level Track consisted of the opening segment, interactive policy dialogues, and a ministerial round table.

318. The High-level Policy sessions were moderated by 11 High-Level Track Facilitators and grouped around different themes identified as important by the WSIS Stakeholders during the open consultation process. Please find more details on the High-Level track here.

319. With the objective of strengthening the alignment of WSIS and SDG processes, the overall theme for WSIS Forum 2022 was “ICTs for Well-Being, Inclusion and Resilience: WSIS Cooperation for Accelerating Progress on the SDGs”.

320. WSIS Forum 2022 resulted in several concrete outcomes that will enable stakeholders to strengthen implementation of WSIS Action Lines and the alignment of the WSIS and SDG processes. Please see here:

- WSIS Forum 2022: Outcome Document
- WSIS Forum 2022 High Level Track Outcomes and Executive Brief
- WSIS Stocktaking Report 2022
- WSIS Forum 2022 and SDG Matrix
- WSIS Stocktaking Success Stories 2022

- WSIS Forum 2022: Report - WSIS Action Lines: Building back better from the coronavirus disease (COVID-19) while advancing the full implementation of the 2030 Agenda for Sustainable Development."

Photographs: WSIS Forum 2022

321. The full list of the WSIS Forum 2022 highlights and outcomes is available here.

WSIS Forum 2022 Participation:

WSIS Forum 2022 Photo Contest:

322. For the WSIS Forum 2022 Photo Contest, stakeholders were invited to picture how ICTs are playing an enabling role in achieving the SDGs, to participate in building a collage of ICT for Sustainable Development photographs from around the world. The contest was launched on 19 August 2021 with a deadline submission on 11 March 2022. During this period, stakeholders were sending photos of their projects, people, and organisations that are leveraging the power of ICTs to make difference.

323. The three winning entries in the WSIS photo contest were unveiled during the final week of the WSIS Forum 2022.

324. **WSIS Forum 2022 Photo Contest Winners:**

1) Creative learning with Scratch

Programming learning with Scratch in an activity of the Club of educational technologies Scratchers Cuba - *University of Informatics Sciences — Cuba*

2) The value of education

This young girl is studying in her laptop. Her entire family is uneducated but she wants to learn new things and also teach to her family. Due to Covid she can't go outside so she is using her laptop - *Sundarban, West Bengal — India (Republic of)*

3) Digital skills for Senior Citizens in Libraries

Using technology to connect two generations and to transfer historical knowledge from the older generation. Through Mobile Literacy programs, Joburg Libraries promote digital literacy and social cohesion where the young teachers the old, about digital content and technoliogy and knowledge is also preserved - *Lenasia Library, Johannesburg — South Africa (Republic of)*

(c) WSIS Action Lines and SDGs Matrix

325. The vital role of ICTs as a catalyst for development is specifically recognized in the new development framework Transforming Our World: The 2030 Agenda for Sustainable Development, which acknowledges that “the spread of information and communication technology and global interconnectedness has great potential to accelerate human progress and to develop knowledge societies, to bridge the digital divide and to develop knowledge societies, as does scientific and technological innovation across areas as diverse as medicine and energy”.

326. Four targets of the SDGs explicitly recognize the role of ICTs. This applies to the targets on Education and scholarships (4.b) on Gender empowerment (5.b) on Infrastructure for Universal and Affordable access to ICTs and the Internet in the Least Developed Countries (9.c) and more broadly, Goal 17 on Strengthen the means of implementation and revitalizing the global partnership for sustainable development, which calls to enhance the use of enabling technology, in particular ICTs. There are also several references to technology in general throughout the SDGs in which ICTs play an important direct or indirect role.

327. ICTs already empower billions of individuals around the world with wide ranging applications cutting across sectoral boundaries in agricultural productivity; population, health and education; transportation; industry, trade and finance; climate change and protection of our environment; as well as for the prevention and management of disasters, among many others.

328. Internet, mobile technologies and relevant ICT applications and services unquestionably help strengthen governance; empower people, in particular women and youth; enable wider exercise of human rights including freedom of expression; foster social inclusion of marginalized groups; open up employment opportunities; promote cultural diversity; expand access to learning and scientific knowledge; and create efficiencies in basic services including energy and water, to name here just a few.

329. However, we do need to acknowledge that, although access to advanced technologies has grown at a fast pace, the impressive gains observed during the MDG era are still hampered by existing gaps in access to ICTs— inequalities still persist among and within countries, between urban and rural sectors and among men and women. A major digital divide is still in place, with more people offline than online and particularly poor access in Least Developed Countries (LDCs).

330. ITU's latest data reveal that while access to the Internet is approaching saturation levels in the developed world, the Net is only accessible to 35% of people in developing countries. The situation in the 48 UN-designated LDCs is particularly critical, with over 90% of people without any kind of Internet connectivity.

331. With the newly adopted 2030 Development Agenda, the WSIS Forum may need to evolve and continues to strengthening the linkages between the WSIS Action Lines and the Sustainable Development Goals, in light of the outcomes of the UN General Assembly Overall Review of the Implementation of WSIS Outcomes.

332. WSIS SDG Matrix: The WSIS Action line and SDG matrix was launched during the WSIS Forum 2015. The matrix aims to underline the key role of ICTs in promoting sustainable development, all WSIS Action Line Facilitators, under coordination by ITU, developed this WSIS-SDG Matrix demonstrating the direct links between the WSIS Action Lines and the proposed SDGs. Please see at : http://www.itu.int/net4/wsis/sdg/

(d) WSIS TalkX

333. The WSIS TalkX is a platform, both virtual and physical, dedicated to sharing experiences and inspirational stories about ICTs for development (implementation of the WSIS Action Lines for Development) by stakeholders all over the world. The WSIS TalkX was initiated during the WSIS Forum 2019 and is continued to be organised in a virtual format since April 2020 at the request of stakeholders. More than 50 sessions (*physical and virtual*) have been conducted, and some sessions have been adapted to podcasts and are available to listen and download at WSIS TalkX Podcast here.

334. The WSIS TalkX this year have been conducted in a virtual format where WSIS stakeholders have highlighted their linkages with the WSIS Action Lines and SDGs, in particular, in relation to the global response to COVID-19. The interactive talk series is also an

opportunity to hear from the globally recognized WSIS Prizes awardees, as well as from the partners of the WSIS Forum.

335. In 2022, the WSIS TalkX was rebranded as the WSIS&SDG TalkX with a series of sessions organised to celebrate the UN international days, including UN International Day of Women and Girls in Science, World Radio Day, International Mother Language Day, to name a few. More information of the WSIS & SDG TalkX sessions are available here.

(e) WSIS Prizes

336. Each year, on the occasion of the WSIS Forum, 18 WSIS stakeholders are awarded WSIS Prizes, as a unique mark of global recognition for excellence in the implementation of WSIS outcomes. WSIS Prizes honor outstanding projects that leverage the power of ICT to accelerate socio-economic development around the globe. To this end, 18 projects are selected as the most successful stories worldwide, under each category, to serve as best-practice models to be replicated by other stakeholders interested in information and communication technologies (ICTs) for development. These projects brilliantly demonstrate how established Sustainable Development Goals (SDGs) can be realized in concrete actions and inspire other stakeholders all over the world to follow their success. Besides recognizing the WSIS Prizes Winners, this year we have continued to implement the WSIS Prize Champions category for the WSIS Prizes 2022 contest.

337. WSIS Prizes is a unique international contest developed in response to requests from the WSIS stakeholders to create an effective mechanism to evaluate and recognize individuals, governments, civil society, local, regional and international agencies, research institutions and private-sector companies for outstanding success in implementing development oriented strategies that leverage the power of ICTs as an enabler of the development. The WSIS Prizes contest is an integral part of the WSIS Stocktaking process (click here for more details) set up in 2004 to assist WSIS implementation and follow-up. The contest was held for the first time in 2012, and rapidly gained attention and popularity within the ICT for Development (ICT4D) community, including ICT for SDG community since 2016.

338. Building upon the outcomes of the United Nations General Assembly Overall Review on WSIS as well as the 2030 Agenda for Sustainable Development, the WSIS Prizes 2021 reflected close linkages with achieving the Sustainable Development Goals (SDGs). The WSIS Prizes contest serves as the platform for identifying and showcasing the success stories across the WSIS Action Lines defined in the Geneva Plan of Action and SDGs. It also provides us with models that can be replicated in the interests of empowering the community at the local level, providing everyone with an opportunity to participate in the contest and, most importantly, recognizing the efforts made by stakeholders to contribute to the development of society and their commitment to achievement of both the WSIS goals and SDGs.

339. Facilitated by ITU in coordination with all WSIS stakeholders, the WSIS Prizes 2022 contest provided a platform to identify and showcase success stories across the WSIS Action Lines defined in the Geneva Plan of Action and Sustainable Development Goals. For the eighth year in a row, WSIS recognized outstanding success stories from around the world for their part in building an inclusive information society. It is a pleasure to have the opportunity to award the WSIS Prize 2022 winners and champions' dedication and commitment in the implementation of the WSIS Outcomes, while honouring the outstanding projects from the international WSIS community.

340. These highly sought-after awards recognize outstanding initiatives from governments, the private sector, civil society and academia that channel the contributions of ICTs towards the betterment of society.

341. The 11thedition of the WSIS Prizes has received another record number of submissions, with 966 ICT projects submitted. Following the results of the online voting with close to million votes cast, 90 WSIS Prizes Champions have been announced online, while 18 WSIS Prizes Winners were awarded on 31 May 2022 in Geneva.

342. The prizes are awarded across 18 categories, each directly linked to the 11 WSIS Action Lines defined in the Geneva Plan of Action.

343. ITU announced 90 Champions of the prestigious WSIS Prizes contest in April this year, while the 18 Winners, out of these 90 Champions, were recognized at the WSIS Prizes ceremony during the final week of the WSIS Forum 2022 on 31 May 2022.

344. In 2022 contest, the 90 WSIS Prizes Champions were recognized through the online voting phase,. Their projects are among the most voted ones and have gained one of the best reviews by the members of the Expert Group. Among the five selected projects per each of 18 categories, one is the Winner, while other runners-up are WSIS Prize Champion.

345. The WSIS Prizes 2022 Winners featured a wide range of impact-driven projects that leverage ICTs to improve lives, bridge digital divides, reduce inequalities and more.

Below is the **full list** of the 18 winners, in order of the WSIS Action Lines:

Action Line C1 - *The role of government and all stakeholders in the promotion of ICTs for development*	Winner: Meghalaya Enterprise Architecture Implementation, India
Action Line C2 - *Information and communication infrastructure*	Winner: Free Wifi for All in Geographically Isolated and Disadvantaged Areas in Western Mindanao, The Philippines
Action Line C3 - *Access to information and knowledge*	Winner: Targeted poverty alleviation management based on GIS and location big data analysis, China
Action Line C4 - *Capacity building*	Winner: Development of women's entrepreneurship and IT skills Tumaris.Tech, Uzbekistan
Action Line C5 - *Building confidence & security in the use of ICTs*	Winner: Cyber Safety program, Qatar
Action Line C6 - *Enabling environment*	Winner: Construction of the 2030 Digital Agenda, Dominican Republic
Action Line C7 - *E-government*	Winner: Digital Land Tax, Bangladesh
Action Line C7 - *E-business*	Winner: Mobile Payment Solution D17, Tunisia
Action Line C7 - *E-learning*	Winner: Emirati School Smart Learning Ecosystem, United Arab Emirates
Action Line C7 - *E-health*	Winner: MonitorFCS App and COVID-19MX App, Mexico
Action Line C7 - *E-employment*	Winner: E-recruitment, Palestine

Action Line C7 - *E-environment*	Winner: #YREstayshome challenge, Denmark
Action Line C7 - *E-agriculture*	Winner: Agriculture Holdings Platform (HSR), Saudi Arabia
Action Line C7 - *E-science*	Winner: Flood Control System, Indonesia
Action Line C8 - *Cultural diversity & identity, linguistic diversity*	Winner: Art and Technology for Climate Change and Green Social Entrepreneurship, Lesotho
Action Line C9 - *Media*	Winner: COVID-19 Radio Response, Canada
Action Line C10 - *Ethical dimensions of the Information Society*	Winner: Apprise Audit, China
Action Line C11 - *International & regional cooperation*	Winner: ASEAN Data Management Framework and Model Contractual Clauses for Cross Border Data Flows, Singapore

346. Detailed descriptions of all WSIS Prizes 2022 winning projects are available here. It is critical to highlight the importance of the multistakeholder and bottom-up approach that is the essential philosophy of the WSIS Forum. Stakeholders highly appreciated the multistakeholder approach of the contest and highlighted the importance of the continuation of this contest to serve as a mechanism to recognize stakeholders for their efforts on the implementation of WSIS outcomes.

347. The principal role of the WSIS Stocktaking exercise is to collect information, share knowledge and experiences and leverage the activities of stakeholders working on the implementation of WSIS outcomes. In this context, WSIS Stocktaking process provides a

portal of best practices for stakeholders seeking updated information on the progress of implementation of WSIS outcomes. All stakeholders benefit from the sharing of interesting case studies, as this undoubtedly facilitates the transfer of knowledge, experiences and models for project implementation. The WSIS platform helps to create partnerships and to provide greater visibility and add value to ICT projects all around the world.

348. All stakeholders are urged to encourage their networks to join the WSIS Prizes process, including the multistakeholder open consultation process for the WSIS Forum 2023, in order to ensure that all features correspond to the real needs of the WSIS implementation process towards 2025.

349. ICTs are enablers for sustainable development, and reporting on ICT success stories to best showcase the possible achievement of SDGs is the major objective of WSIS Stocktaking process, including WSIS Prizes, as already recognized and anticipated by the WSIS stakeholders community. The contest thus comprises 18 categories which are linked to the 11 WSIS Action Lines outlined in the Geneva Plan of Action and SDGs. Submitted projects are to be recognized solely for the 18 categories covering the 11 WSIS Action Lines.

WSIS Prizes 2023:

350. ITU is pleased to announce that the WSIS Prizes 2023 call, 12th edition of this major global exercise in recognizing best ICT practices that are implementing the WSIS Action Lines and advancing the Sustainable Development Goals will soon be launched.

351. Phase 1 will open the call for submissions from 7 September to 7 December 2022 to the contest of the WSIS Prizes 2023. During this phase, all stakeholders are invited to submit WSIS related project to the WSIS Prizes 2023 contest.

(d) WSIS Stocktaking Portal

352. All stakeholders benefit from the sharing of interesting case studies, by the undoubtedly facilitation of the transfer of knowledge, experiences, and models for project implementation. The WSIS Stocktaking platform, launched in February 2010, helps to

create partnerships, provide greater visibility, and add value to ICT projects all around the world. The many and varied stakeholders who have implemented innovative projects and contributed to the success of the WSIS Stocktaking process deserve our sincere gratitude.

353. WSIS Stocktaking Portal provides a repository of best practices for stakeholders seeking updated information on progress in the implementation of WSIS outcomes (§ 28.e of the Geneva Plan of Action). The WSIS Stocktaking Platform, transformed the previous static database into a unique portal to highlight ICT-related projects and initiatives in line with WSIS implementation.

354. The principal role of the WSIS Stocktaking exercise is to leverage the activities of stakeholders working on the implementation of WSIS outcomes and share knowledge and experience of projects by replicating successful models designed to achieve SDGs. The WSIS Stocktaking process was initiated in October 2004 during the Tunis phase of WSIS, and in the years since then it has come to comprise the database of:

- exchanges of information on projects,
- sharing of best practices of certain regions,
- initiatives related to the implementation of the 11 WSIS Action Lines
- linkages between the 11 Action Lines and the Sustainable Development Goals (SDGs) - a linkage that became an essential guideline of the WSIS Stocktaking process.

355. The WSIS Stocktaking process provides a register of activities, including, projects, programmes, training initiatives, conferences, websites, guidelines, tool-kits, etc., carried out by governments, international organizations, the private sector, civil society and other entities. To that end, in accordance with of the Tunis Agenda for the Information Society (TAIS) adopted by WSIS, ITU has been maintaining the WSIS Stocktaking Database as a publicly accessible system providing information on ICT-related initiatives and projects with reference to the 11 WSIS action lines (Geneva Plan of Action) and 17 SDGs.

356. As in 2015, the UN General Assembly within the framework of the ten-year review of the WSIS (Res.A/70/125) called for a close alignment between the WSIS process and the 2030 Agenda for Sustainable Development (Res.A/70/1). The WSIS Stocktaking process responded by highlighting the contribution of 11 WSIS Action Lines to the achievement of 17 Sustainable Development Goals.

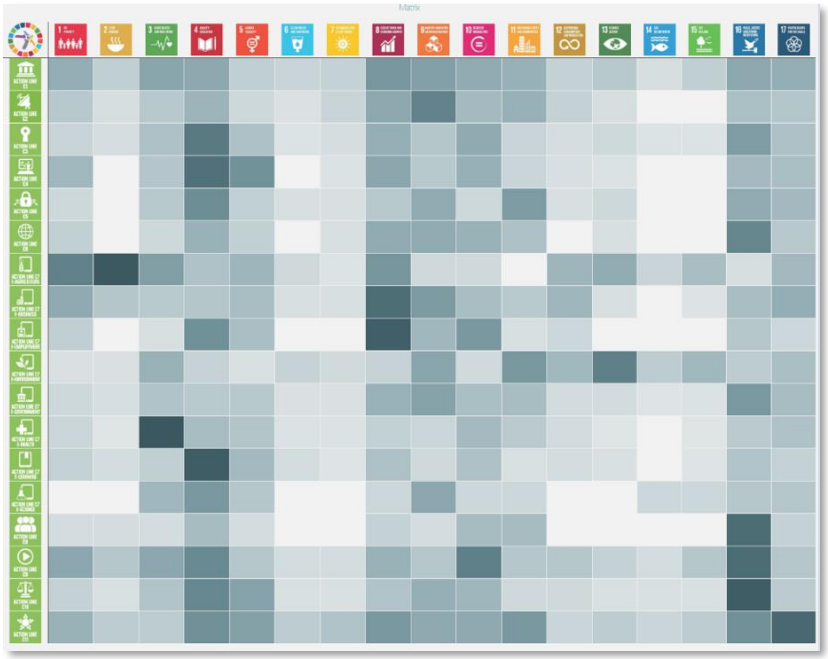
357. The direct linkages between the WSIS Action Lines and the SDGs set out below are crucial to continuing to strengthen the impact of ICTs for sustainable development. Each UN action line facilitator has analyzed the connections and relations between their respective action lines and the proposed SDGs and their targets to create a clear and direct linkage and an explicit connection between the key aim of WSIS - that of harnessing the potential of ICTs to promote and realize the development goals – and the post-2015 development agenda, so as to contribute to realization of the latter.

358. At the WSIS Forum 2015, the SDG matrix was extremely well received by the WSIS community, offering as it does a better explanation of the potential of ICTs as enablers for sustainable development. A new component was introduced in the WSIS Stocktaking process in the form of reporting ICT success stories to best showcase the possible

achievement of SDGs through the implementation of WSIS action line-related projects. The majority of the collected submissions in 2020 clearly showcase the linkage between their related action lines and the various SDGs and targets.

359. WSIS Stocktaking Platform was introduced in 2010, providing a repository of best practices for stakeholders seeking updated information on progress in the implementation of WSIS outcomes (§ 28.e of the Geneva Plan of Action), continues to foster implementation of the WSIS outcomes and to facilitate exchange of information among its community of close to half a million WSIS stakeholders representing governments, the private sector, international organizations, civil society, and others. We continue to maintain and improve the WSIS Stocktaking Database, which contains more than 14,000 entries so far. This encouraging outcome reinforces stakeholders' belief in and commitment to the WSIS Stocktaking process and their desire to share best practices.

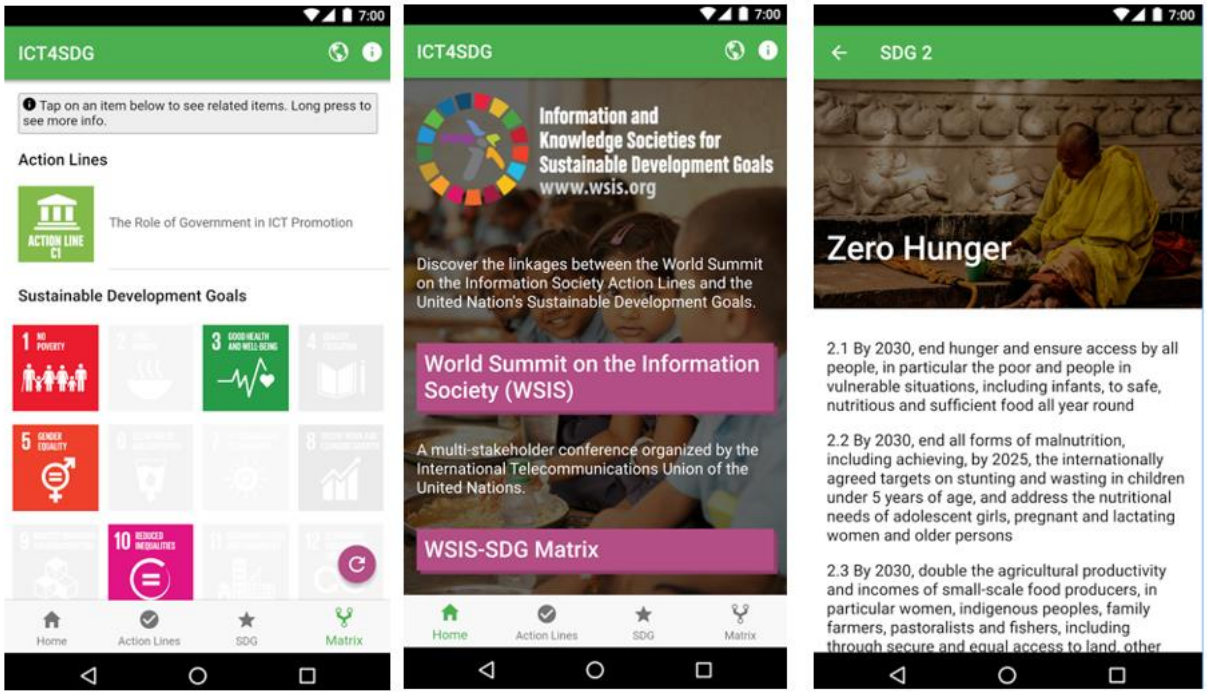
360. New WSIS Stocktaking products were introduced in 2019 with positive feedback from the WSIS stakeholders who showed much interest in using them. One such products has been designed in a form of an interactive matrix that is to be used as a graphical representation of WSIS and SDG data collected through the implementation of the WSIS Stocktaking process, where the individual values contained in a matrix are represented colourfully.



361. Shifting from theory to practice and impact, using the data from the WSIS Stocktaking platform, including projects submitted for the WSIS Prizes in past two years (when we have started to reflect on SDGs), the objective of this product is to draw conclusions from the automated matrix providing strength of proposed links between WSIS Action Lines and SDGs, and the analysis of connections and relations between the respective Action Line with the proposed SDGs and their targets, as proposed by each Action Line Facilitator.

362. Furthermore, using the data provided for the WSIS Stocktaking process since 2016, in cooperation with the WSIS Prizes 2016 Champion, AgriNeTT from the University of West Indies, Trinidad and Tobago, the WSIS team has been developing a mobile application aiming to provide information on the linkages between WSIS Action Lines and SDGs. The launch of this application took place during the World Café on WSIS Stocktaking at the WSIS Forum 2017, providing a quick access to relevant information on WSIS Action Lines and SDGs to WSIS stakeholders community at the Forum and beyond It portrays the WSIS-SDG Matrix, developed at WSIS Forum 2015 together with the UN Action Line Facilitators, with detailed information on each WSIS Action Line and SDG. New edition of the application is

soon to be released showing the linkages on the ground by listing the projects submitted for the WSIS Stocktaking in past two years, since we started monitoring SDG process within the WSIS Stocktaking. This application was much appreciated and welcomed by the community at the WSIS Forum 2018 with a vibrant discussion on how to best use it, while new features were proposed to be considered in the future editions.



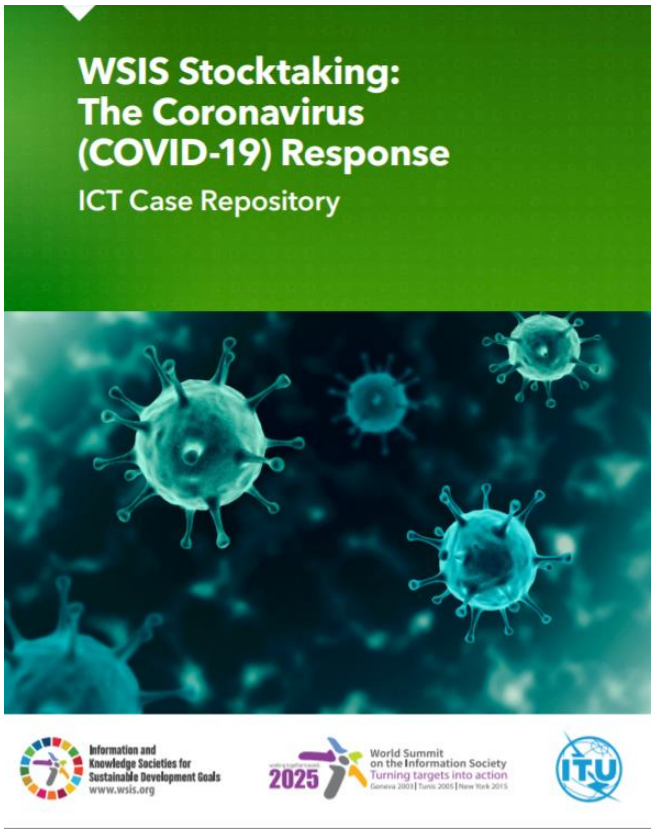
363. In 2017, as requested by the WSIS community during the WSIS Forum 2017, we have developed a **WSIS Stocktaking embeddable interface**, product that has much potential in expending the WSIS Stocktaking process through the WSIS multistakeholder community by uploading the WSIS Stocktaking platform in a form of an iFrame on portraying it on their websites and platforms. In 2018 we continue to develop this interface because we are convinced that Stocktaking is one of the best ways to collect and share projects and success stories. Thanks to this interface, the visitors are able to view live entries (live results are customizable upon a particular WSIS Action Line or SDG or region or other data focus relevant to the user), search the WSIS stocktaking database within partners' websites environment, and to submit ICT-related projects from the embeddable WSIS Stocktaking interface for the WSIS Prizes contests or for the WSIS Stocktaking reports:

- WSIS Stocktaking ensuring the opportunity for expanded collection of ICT projects and initiatives with NEW embeddable interface
- Embed this iframe on your websites facilitating sharing local success stories with global community
- Enrich content of your web site sharing the good ICT for SDG practices from all over the word

364. We encourage all WSIS stakeholders to consider using new WSIS Stocktaking product and:

- Provide opportunity for their networks and communities to SEARCH on collected ICT projects by WSIS Action Lines or SDGs
- Provide opportunity to their website visitors to join global effort and SUBMIT many ICT projects under the radar

365. In April 2020, as a part of the WSIS Stocktaking ongoing efforts to promote the good use of ICTs in making social impact, and in order to provide useful, replicable and actionable information to all WSIS community and beyond, the WSIS Stocktaking platform became available for collecting projects and activities on how ICTs are assisting stakeholders in their everyday life, work, and combating challenges caused by this extraordinary pandemic.



The aim of this The Coronavirus (COVID-19) Response – ICT Case Repository is to help you to continue to partner, collaborate and implement in these exceptional circumstances. Once received, the projects will be reviewed and will be featured on the WSIS Stocktaking Platform and promoted through various channels including the WSIS Flash newsletter, WSIS TalkX and social media channels.

In the first edition of this special report, issued in November 2020, more than 200 projects were featured. During the WSIS Forum 2021 final week (17-21 May), the second edition of this report was presented with more than 400 ICT projects and iniatives responding to COVID19.

We invite all to SUBMIT, SHARE and PROMOTE this call for innovative use of ICTs to respond to the coronavirus outbreak:

https://www.itu.int/net4/wsis/stocktaking/Surveys/Surveys/Submit/1586304863752560 4#sform

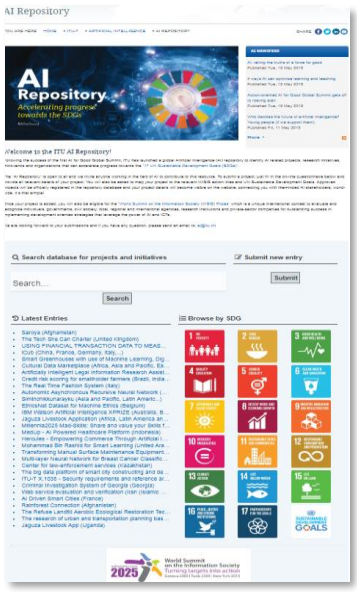
366. In 2021, at the request of and in collaboration with the WSIS stakeholders, a new repository *WSIS Stocktaking Repository of Women in Technology* was launched to strengthen the ICTs and Gender Mainstreaming activities on WSIS. The aim of this repository is to identify and connect women leaders and practitioners in all sectors of the ICT industry from all regions and engage them in events, forums (e.g. WSIS Forum) and activities such as various workshops, training courses, networking events, aimed at fostering a dialogue on the use of ICTs as a means for implementing the Sustainable Development Goals.

367. Another special repository was launched to support the launch of the Healthy Ageing Innovation Prize. The WSIS Forum Healthy Ageing Innovation Prize focused on ICTs that specifically address the needs of people 60+ to achieve and sustain an active and engaged life as they age. The Prize Coordination Team has selected 12 Finalists for this year's award.

368. The WSIS Healthy Ageing Innovation Prize, which was initiated in 2021 was continued this year. This Prize is an exceptional international recognition of WSIS Stakeholders as leaders for their excellence in supporting innovation that brings sustainable solutions for the ever-increasing global population of older people.

369. As a part of the Special Track on ICTs and Older Persons, the WSIS Forum together with the Global Coalition on Aging (GCOA) and other stakeholders have created this prize and offered the winner a cash prize as well as recognition at the WSIS Forum. Submissions were made through the official submission form, hosted on the WSIS Stocktaking platform.

370. The winning projects showcased together with all valid submission in the special WSIS Stocktaking: ICTs and Older Persons publication, while all submitted descriptions of projects and activities will be reflected on the WSIS Stocktaking platform. In collaboration with the Telecommunication Standardization Bureau (TSB) of ITU, WSIS Stocktaking has produced a customized segment of the online platform, serving for the benefits of AI Repository for collecting international best practices of the artificial intelligence (AI) for development, striving to provide tangible overview of projects and initiatives in this emerging field. Although customized for the needs of the AI for Good Global Summit and TSB objectives, the inputs are also be reflecting the essential components of the WSIS Stocktaking, namely all inputs will reflect projects' implementation of the WSIS Action Lines and how ICTs are advancing sustainable development around the world using AI technology. Within last year, more than 140 AI Projects were collected. All submitted projects were also considered for the WSIS Prizes 2020 contest.



371. We invite all ICT4D community stakeholders to visit the ITU AI Repository and explore latest entries and browse by SDGs, search for good AI practices advancing sustainable development worldwide, and submit AI-related projects and initiatives and be globally recognized.

372. We invite all stakeholders to take part in this unique opportunity towards evidence based policy making and promote it within different communities and networks. The WSIS Team will provide the necessary information, sufficient to test and run the interface, upon request.

373. The WSIS Stocktaking process has been maintained by ITU since 2004 as requested by the WSIS Outcomes (TAIS, Para 120). This publicly accessible WSIS Stocktaking database (here), currently with close to 15,000 entries and a growing up community of 450,000 stakeholders, is a unique global tool for collecting information and regular reporting on information and communication technology related initiatives and projects, carried out by governments, international organizations, civil society, the private sector, academia and other entities, in the context of the 11 WSIS Action Lines.

374. The new call for update and new entries 2023 is inviting stakeholders to submit entries online at www.wsis.org/stocktaking. Submitted activities will be reflected in various forms in the WSIS Stocktaking 2023 (reports, exhibitions, videos etc.) which will be released at WSIS Forum 2023 to be held in March 2023. We look forward to receiving your responses to this call.

(e) WSIS Stocktaking Publications

375. This year, 966 ICT-related projects from around the world were submitted for the Report on the WSIS Stocktaking 2022 by the WSIS Stakeholder community. The thirteenth edition of the Report on WSIS Stocktaking set a new record of global multistakeholder engagement in implementation of WSIS action lines for SDGs. The Report was presented during the final week of the virtual WSIS Forum 2021, 17-21 May 2021.

376. The 2022 edition of the Report on the WSIS Stocktaking is the continuation of the series. This thirteenth edition reflects 966 activities relating to ICTs for development, submitted to the WSIS Stocktaking Platform from 1 September 2021 to 21 January 2022, each one highlighting the efforts deployed by stakeholders involved in the implementation of the SDGs. The Report is based on the multistakeholder approach, including input from stakeholders from all over the world responding to ITU's official call in 2022 for Stocktaking updates and new entries. The inputs from WSIS action line facilitators and co-facilitators also contributed to the present Report.

Global WSIS Stocktaking Reports 2022:

- WSIS Stocktaking Report 2022
- WSIS Stocktaking Success Stories 2022
- The Coronavirus (COVID-19) Response – ICT Case Repository Special Report 2022

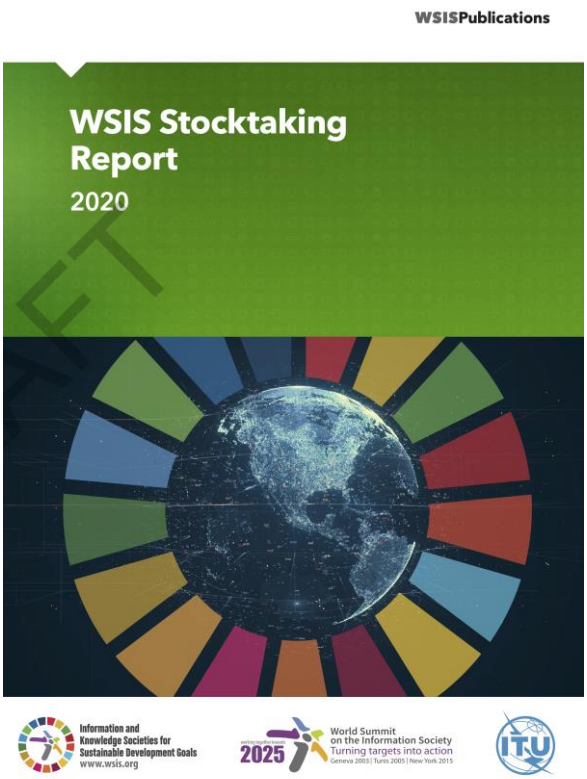
Regional WSIS Stocktaking Reports 2021-2022:

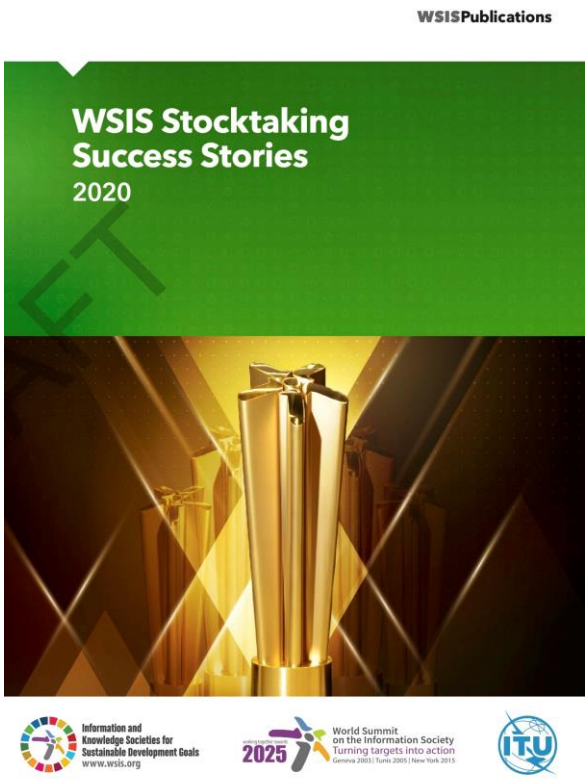
- WSIS Regional Stocktaking Report in Africa 2021-2022

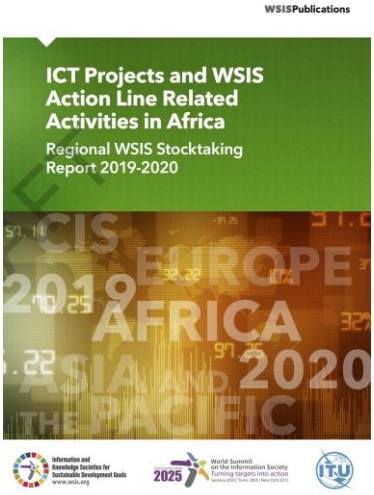
- WSIS Regional Stocktaking Report in the Americas 2021-2022
- WSIS Regional Stocktaking Report in Arab States 2021-2022
- WSIS Regional Stocktaking Report in Asia and Pacific 2021-2022
- WSIS Regional Stocktaking Report in Commonwealth of Independent States (CIS) 2021-2022
- WSIS Regional Stocktaking Report in Europe 2021-2022

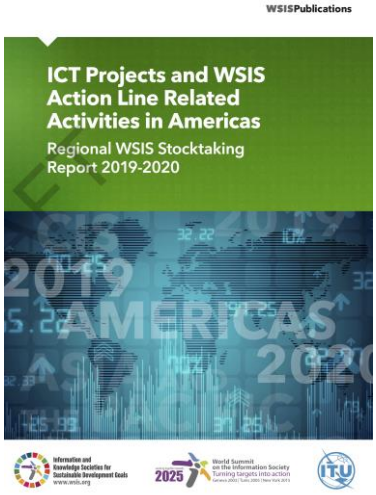
377. Since the WSIS Stocktaking Process was established, fifteenth editions of global WSIS Stocktaking Reports have been published, providing an overall picture of progress and an insight into latest WSIS-related activities. Since the 2016 Report, all reports also focused on contributions by stakeholders worldwide to WSIS and Sustainable Development Goals. The 2022 Report seeks to provide key findings on emerging trends in the development of the information society, and references major activities being implemented in the eighteen areas covered by the eleven WSIS Action Lines and seventeen SDGs.

378. WSIS-related publications, including the WSIS Stocktaking reports are available to download at the ITU Bookshop.






WSISPublications
ICT Projects and WSIS Action Line Related Activities in Africa
Regional WSIS Stocktaking Report 2019-2020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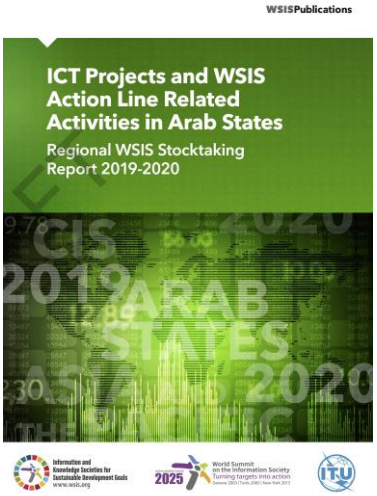
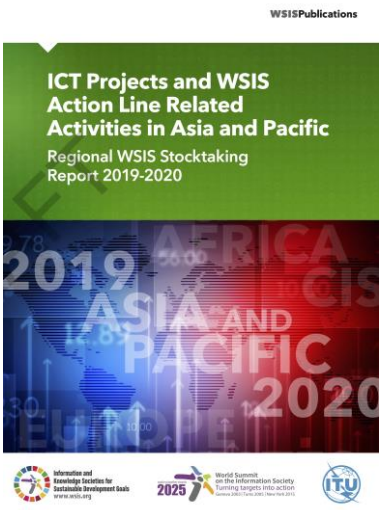
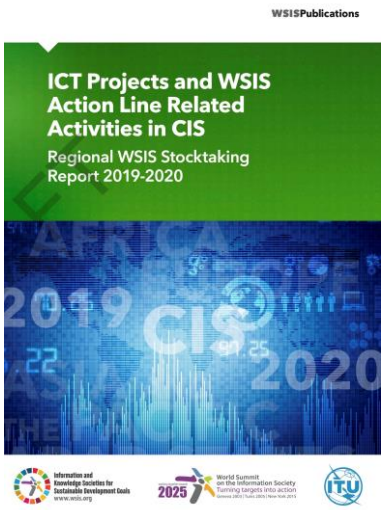
ICT Projects and WSIS Action Line Related Activities in Americas
Regional WSIS Stocktaking Report 2019-2020

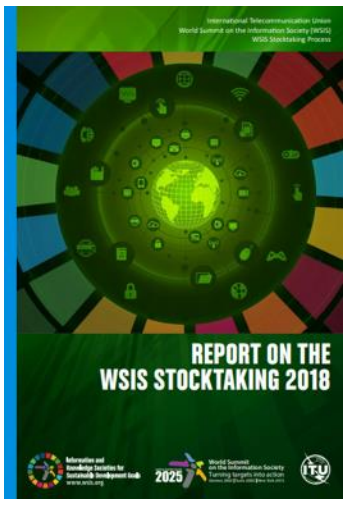

WSISPublications
ICT Projects and WSIS Action Line Related Activities in Arab States
Regional WSIS Stocktaking Report 2019-2020

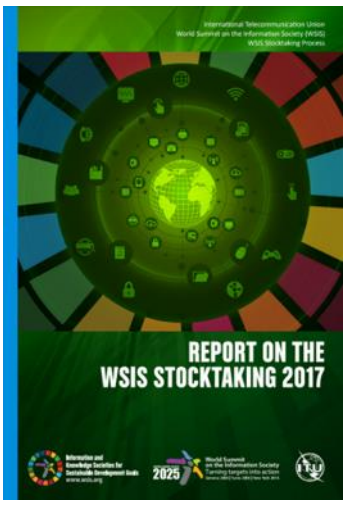

WSISPublications
ICT Projects and WSIS Action Line Related Activities in Asia and Pacific
Regional WSIS Stocktaking Report 2019-2020


WSISPublications
ICT Projects and WSIS Action Line Related Activities in CIS
Regional WSIS Stocktaking Report 2019-2020

WSISPublications
ICT Projects and WSIS Action Line Related Activities in Europe
Regional WSIS Stocktaking Report 2019-2020

REPORT ON THE WSIS STOCKTAKING 2019


REPORT ON THE WSIS STOCKTAKING 2018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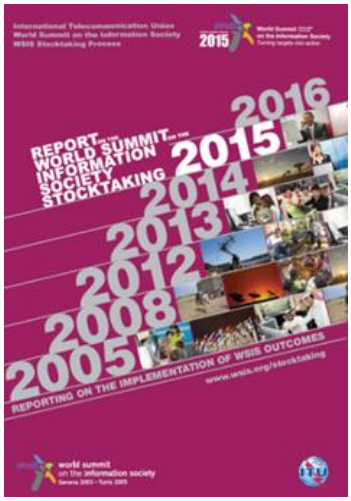
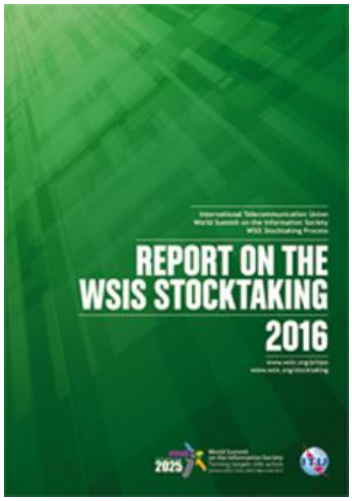
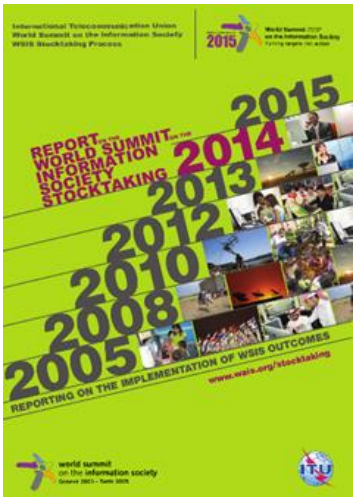
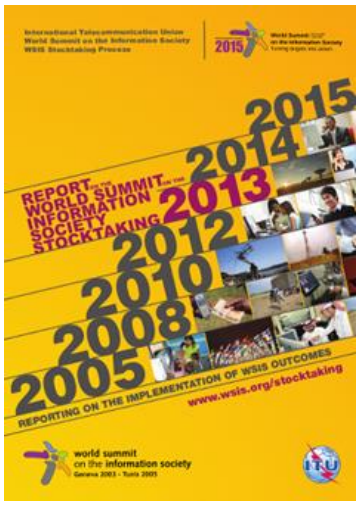
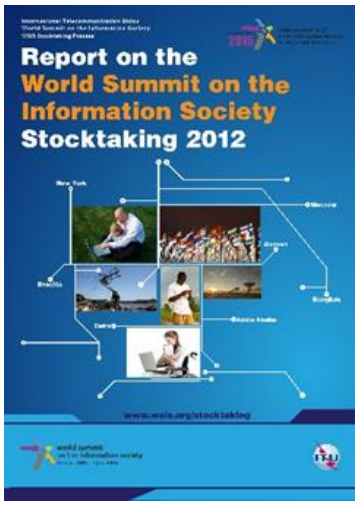
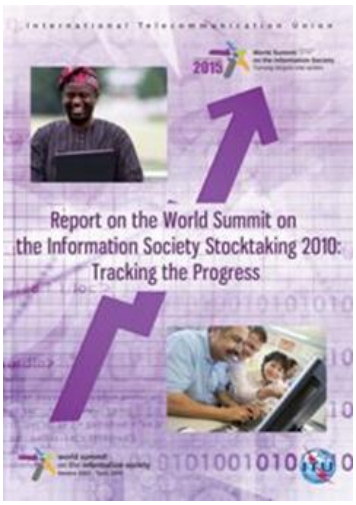


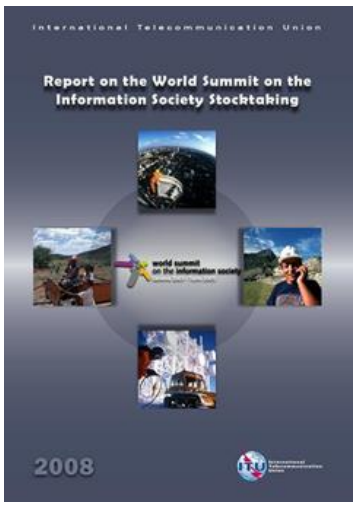












379. Following the outcomes of the United Nations General Assembly Overall Review on WSIS (Res. A/70/125) that called for a close alignment between the WSIS Process and the 2030 Agenda for Sustainable Development (Res. A/70/1), the WSIS Prizes is the unique global platform to identify and showcase success stories in the implementation of the WSIS Action Lines and SDGs.

380. The United Nations Economic and Social Council (ECOSOC) Resolution 2020/12 on Assessment of the progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society reiterates the importance of sharing best practices at the global level, and, encourages all stakeholders to nominate their projects for the annual WSIS Prizes as an integral part of the WSIS Stocktaking process (www.wsis.org/stocktaking). The same Resolution also reiterates the importance of recognizing excellence in the implementation of the projects and initiatives that further the goals of the World Summit on the Information Society process, and encourages all stakeholders to nominate their ICT-related projects for the annual WSIS Prizes contest as an integral part of the WSIS Stocktaking process. With the year-round ongoing call for updates and new entries, all stakeholders are invited to continue sharing best practices on the WSIS Stocktaking Platform and emphasize how ICT-related initiatives and projects are enabling SDGs.

(f) WSIS Forum Photo Contest 2022

381. The World Summit on Information Society (WSIS) Forum launched its first-ever photo contest in 2017 – asking WSIS stakeholders community to picture a more sustainable world, with the theme: Information and Knowledge Societies for Achieving the Sustainable Development Goals. Following the successful previous editions, we have continued to exercise the Photo Contest and invite the community to picture how Information and Communication Technologies are playing an enabling role in achieving the Sustainable Development Goals. Participate in building a collage of ICT for Sustainable Development photographs from around the world by promoting the Photo Contest within your networks and communities. The deadline to submit photos was on 7 March 2022.

382. WSIS Forum invited the community to picture how ICTs are playing an enabling role in achieving the SDGs. Photographers from around the globe were invited to share photo submissions that depict the use of ICTs for development.

383. The three winning entries in the WSIS photo contest were announced at the WSIS Forum 2022. Please see here for more information: https://www.itu.int/net4/wsis/forum/2022/PhotoContest

(g) Exhibition

384. WSIS Forum 2022 gathered many exhibitors from Civil Society, Academia, International Organizations, Private Sector, and Governments. The exhibition allowed a wide array of stakeholders to showcase their projects and the technology behind it. It provided an opportunity to share their initiatives and solutions that harness the power of ICT-enabled development to advance the achievement of the SDGs and expand our Information Society.

385. The WSIS Forum 2022 comprised of both virtual and physical. The exhibitors in various stakeholder categories showcased the projects through our virtual and physical and exhibition platforms. The aim of the exhibition and networking platforms was to facilitate a free-flowing and social environment within the WSIS Forum, where stakeholders could interact and form partnerships according to their interests in alignment with the WSIS Action Lines and UN SDGs.

386. The exhibition inauguration took place on 31 May 2022 at 10:45 am CEST, in the ITU Popov area, where ITU Secretary General Mr. Houlin Zhao, the WSIS Forum 2022 Chairman H.E. Professor Isa Ali Ibrahim (Pantami) honoured the event, with several WSIS Forum 2022 partners who also were exhibitors, present.

387. WSIS Forum 2022 virtual exhibition can be seen here: https://wsisforum2022.delegateconnect.co/

(h) Hackathon

388. WSIS Forum 2022 Hackathon on ICTs for Indigenous Languages was held virtually, in collaboration with UNESCO and other stakeholders. The virtual hackathon was organised to support the International Decade of Indigenous Languages (2022-2032) and its Global Action Plan. The Hackathon aimed to ideate and create ICT solutions that contribute to the intergenerational transmission, preservation, revitalization, and promotion of Indigenous languages.

389. The virtual hackathon ideated ICT solutions that respond to three challenge areas, namely (i) Knowledge, creation of favourable conditions for knowledge-sharing and dissemination of good practices on Indigenous languages (content management systems, databases); ii) Empowerment, proposing trainings and capacity building programmes and solutions to learn and preserve Indigenous languages; and (iii) Preservation, sustaining and archiving tools to build access preserve, protect and revitalize Indigenous languages.

390. The Hackathon attracted 691 participants from more than 75 countries, with the support of the Internet Society and Nokia. Three winners from each challenge areas were announced at the High-Level Dialogue on ICTs for Indigenous Languages during the final week. One winning team in each challenge area received a 6-month mentorship through Nokia to prepare the concept for release as well as a $1,000 cash prize. More information of WSIS Forum 2022 Hackathon here.

(i) WSIS Special Initiatives

391. **ICTs and Gender Mainstreaming**

In August 2021, WSIS launched a new repository called WSIS Stocktaking Repository of Women in Technology (http://www.itu.int/go/WSISGender). The initiative was derived from stakeholders' request and resulted from the discussions of the ICTs and Gender Mainstreaming special track at the WSIS Forum 2021.

This repository provides opportunities to connect with women leaders and practitioners in all sectors of the ICT industry from all regions and to engage in various activities on ICTs and Gender Mainstreaming, such as workshops, training courses, networking events, WSIS Forum, and others that aimed at fostering a dialogue on the use of ICTs as a means for implementing the SDGs.

392. As part of the Gender Mainstreaming initiatives, the WSIS launched a call for the WSIS Gender Trendsetters nominations who will act as trailblazers and work to strengthen gender equality through a range of initiatives and activities. To promote the repository, the first cohort of the WSIS Gender Trendsetters were appointed and announced during the WSIS Forum 2022. The WSIS Gender Trendsetters was asked to propose a challenge/pledge

of their choice in the field of Gender Mainstreaming. More information about the WSIS Gender Trendsetters and their pledges are available here.

393. **ICTs and Older Persons:**

- This special initiative addresses the role of ICTs in combating age-based discrimination in the workplace, achieving healthier ageing, building smarter cities, ensuring the financial inclusion of older persons, and supporting millions of caregivers across the world and in digital inclusion across the generations to enable the Decade of Healthy Ageing 2020–2030.

- Following the successful launch of the WSIS Forum 2021 Healthy Ageing Innovation Prize, the special repository of solutions for ageing well with ICTs has been established and continues to call for submissions.

- The second edition of the WSIS Forum 2022 Healthy Ageing Innovation Prize was organised as part of the WSIS Forum 2022. The call for submissions was launched in December 2021. 11 finalists were selected for their outstanding projects in supporting healthy ageing for Older Persons. The winner of the Prize was HiNouNou - The open APP platform -Ecosystem centric to Older Adults to promote Healthy Longevity. For more information, please read here.

- As an outcome of the WSIS Forum ICTs and Older Persons special track in 2021, the stakeholders have initiated the creation of the ***WSIS Multistakeholder Alliance on ICTs and Older Persons*** across the generations to foster healthy ageing as part of the UN Decade of Healthy Ageing. The work within the framework of the Multistakeholder Alliance on ICTs and Older Persons is divided into 4 groups with the following topics: (i) Design & Accessibility; (ii) Capacity Building & Education; (iii) Cybersecurity issues; (iv) Innovation; and (v) Healthy Ageing.

394. **WSIS Youth Campaigners:**

The WSIS Youth Campaigns strive to provide young people and to representatives of youth communities with a platform to share their vision for the efficient use of ICTs in enabling

sustainable development, the challenges they might encounter on this path, and the solutions young people are already providing to their professional and personal communities. The activities of the WSIS Youth Campaigns aim to contribute to the purposes of the ICTs and Youth Track. In addition, it aims to foster a community of talented, ambitious, and diverse youth groups, whose work will be exhibited via the WSIS Forum.

The first generation of 12 WSIS Youth Campaigners have been chosen due to their ongoing work with the youth communities and proved dedication to development. The WSIS Forum 2022 ICTs and Youth special track was organised and covered the following topics:

- ICTs & Youth Empowerment
- ICTs & Business
- ICTs & Climate Change

395. **ICTs and Indigenous Languages:**

ITU, UNESCO, and relevant stakeholders were jointly organised a WSIS Forum 2022 Hackathon on ICTs for Indigenous Languages.

The Hackathon called on stakeholders to form teams to explore the use of ICTs in preventing, revitalising, and promoting the indigenous languages.

The Hackathon is linked with the Global Action Plan for Making a Decade of Action for Indigenous Languages, WSIS Action Lines, and the Sustainable Development Goals.

A High-Level Dialogue on Indigenous Languages, organised by ITU and UNESCO, was held on 1 June 2022 during the WSIS Forum 2022 final week. This session also includes a closing segment dedicated to the winners of the WSIS Forum 2022 Hackathon on Indigenous Languages.

To support the International Decade of Indigenous Languages (2022-2032), activities around this topic will be further strengthened at the upcoming WSIS Forum. A special track on ICTs and Indigenous Languages will be initiated at the WSIS Forum 2023 to provide space for discourse on the important role that indigenous languages could play towards sustainable development with ICTs that are made accessible, inclusive and affordable for all.

Further, a WSIS Special Prize on ICTs for Preserving, Revitalizing and Promoting Indigenous Languages will also be launched for the WSIS Forum 2023.

(j) WSIS+20: Review and WSIS Beyond 2025

396. In 2015, the UN General Assembly Overall Review resolved to hold the WSIS Forum on the annual basis till 2025. WSIS+20 will provide opportunity to reflect and discuss on the evolution of the WSIS implementation process.

397. *Report by the Director General on implementation of the World Summit on the Information Society (WSIS) outcomes*, elaborates UNESCO's roadmap towards the WSIS+20 review.

398. *World Summit on the Information Society (WSIS)+20: WSIS Beyond 2025: WSIS+20 Roadmap*; elaborates the ITU Secretary-General's roadmap on the role of ITU in the WSIS+20 Review process and its preparations.

399. At the WSIS Forum 2022, several multistakeholder dialogues and discussions were held to discuss on the preliminary steps towards the WSIS+20 review process, including:

- Knowledge Café: WSIS+20, 30 May 2022
- High-Level Strategic Dialogue: WSIS+20: Multistakeholder Digital Cooperation for Global Development (WSIS Action Lines to achieve the SDGs), 31 May 2022
- High-Level Dialogue: WSIS+20 – WSIS Beyond 2025, 2 June 2022

400. WSIS Forum 2024 will be branded as the WSIS+20 Forum High-level Event celebrating the achievements of the WSIS Process and identifying the opportunities and challenges in implementing the WSIS Action Lines.

(k) The Global Cyber Security Agenda (GCA)

401. In May 2007, ITU launched the GCA: a framework for international cooperation in cyber security. The GCA has seven main strategic goals and is built around the following five work areas or pillars: (1) Legal Measures; (2) Technical and Procedural Measures; (3) Organizational Structures; (4) Capacity Building; and (5) International Cooperation. It acts on existing national and regional initiatives to avoid duplication of work and encourage collaboration amongst all relevant partners. Within the overall framework of the cyber security agenda (GCA), ITU along with its partners, are deploying joint services. These services harmonize, at the international level, different national approaches to better prepare countries to face cyber threats and solve cyber-attacks. This is achieved through information sharing, awareness raising and trainings programs. The momentum generated by the GCA and the broad nature of this ITU initiative have resulted in interest from other stakeholders and opportunities for collaboration and cooperation. More on activities under the GCA can be found in the Section on Action Line C5: Building Confidence and Security in the use of ICTs.

402. Second Open Consultation on the draft Guidelines for utilization of the GCA was held during the WSIS Forum 2021 on 1 March 2021.

(l) Connect 2030 Agenda for global telecommunication/ICT development

1. Background

403. At the 2018 Plenipotentiary Conference (PP-18), ITU Member States adopted Resolution 200 (Rev. Dubai, 2018): "Connect 2030 Agenda for global telecommunication/information and communication technology, including broadband, for sustainable development", establishing a set of global targets to be achieved by the whole Union by 2023 in the areas of growth, inclusiveness, sustainability, innovation and partnerships in the telecommunication/ICT sector.

404. Resolution 200 invites ITU Member States to participate actively in the implementation of the Connect 2030 Agenda; to contribute with national, regional, and international initiatives; to provide data and statistics, as appropriate, to monitor progress towards the

achievement of the Connect 2030 goals and targets; and to engage all stakeholders through the promotion of partnerships around the Connect 2030 Agenda.

405. At PP-18, ITU Member States also adopted Resolution 71 (Rev. Dubai, 2018): "Strategic plan for the Union for 2020-2023", which incorporates the Connect 2030 goals and targets into the framework of ITU's strategic plan for the 2020-2023 period.

2. Progress for the reporting period

Measurement, monitoring and reporting

406. An annual report on the progress and implementation of ITU Strategic Plan and the Connect 2030 Agenda is presented each year to ITU Council. The latest report for the period 2019-2020 was presented in June 2021 and is available online (ITU Annual Report 2019-2020).

407. A dedicated microsite for the Connect 2030 Agenda was also created to measure, in a yearly basis as from 2020, the progress of the Connect 2030 Agenda targets. The microsite provides a dashboard for both the goals and targets, as well as relevant links to publications, data and other resources, so that ITU and its members can progress together towards connecting the world.

408. The Connect 2030 Agenda has 24 targets designed to provide an indication of progress towards the achievement of the 5 goals up to 2023:

Goal 1 – Growth: Enable and foster access to and increased use of telecommunications/ICT in support of the digital economy and society.

Recognizing the role of telecommunications/ICTs as a key enabler for social, economic and environmentally sustainable development, ITU will work to enable and foster access to, and increase the use of, telecommunications/ICTs, foster the development of telecommunications/ICTs in the support of the digital economy and help developing countries make their transition to the digital economy. Growth in the use of telecommunications/ICTs has a positive impact on short- and long-term socio-economic development as well as on the growth of the digital economy towards building an inclusive information society. The Union is committed to working together and collaborating with all stakeholders in the telecommunication/ICT environment in order to achieve this goal.

- Target 1.1: By 2023, 65% of households worldwide with access to the Internet
- Target 1.2: By 2023, 70% of individuals worldwide will be using the Internet
- Target 1.3: By 2023, Internet access should be 25% more affordable (baseline year 2017)
- Target 1.4: By 2023, all countries adopt a digital agenda/strategy
- Target 1.5: By 2023, increase the number of broadband subscriptions by 50%
- Target 1.6: By 2023, 40% of countries to have more than half of broadband subscriptions more than 10 Mbit/s
- Target 1.7: By 2023, 40% of the population should be interacting with government services online

Goal 2 – Inclusiveness: Bridge the digital divide and provide broadband access for all.

Being committed to ensuring that everyone without exception benefits from telecommunications/ICTs, ITU will work to bridge the digital divide for an inclusive information society and enable the provision of broadband access for all, leaving no one offline. Bridging the digital divide focuses on global telecommunication/ICT inclusiveness, fostering telecommunication/ICT access, accessibility, affordability and use in all countries and regions and for all peoples, including women and girls, youth and marginal and vulnerable populations, people from lower socio-economic groups, indigenous peoples, older persons and persons with disabilities.

- Target 2.1: By 2023, in the developing world, 60% of households should have access to the Internet
- Target 2.2: By 2023, in the least developed countries, 30% of households should have access to the Internet
- Target 2.3: By 2023, in the developing world, 60% of individuals will be using the Internet
- Target 2.4: By 2023, in the least developed countries, 30% of individuals will be using the Internet
- Target 2.5: By 2023, the affordability gap between developed and developing countries should be reduced by 25% (baseline year 2017)
- Target 2.6: By 2023, broadband services should cost no more than 3% of average monthly income in developing countries
- Target 2.7: By 2023, 96% of the world population covered by broadband services
- Target 2.8: by 2023, gender equality in Internet usage and mobile phone ownership should be achieved
- Target 2.9: By 2023, enabling environments ensuring accessible telecommunications/ICTs for persons with disabilities should be established in all countries
- Target 2.10: By 2023, improve by 40% the proportion of youth/adults with telecommunication/ICT skills

Goal 3 – Sustainability: Manage emerging risks, challenges and opportunities resulting from the rapid growth of telecommunications/ICT.

To promote the beneficial use of telecommunications/ICTs, ITU recognizes the need to manage emerging risks, challenges and opportunities from the rapid growth of telecommunications/ICTs. The Union focuses on enhancing the quality, reliability, sustainability and resilience of networks and systems as well as building confidence and security in the use of telecommunications/ICTs. Accordingly, the Union will work to make it possible to seize of opportunities presented by telecommunications/ICTs while working towards minimizing the negative impact of undesired collaterals.

- Target 3.1: By 2023, improve cybersecurity preparedness of countries, with key capabilities: presence of strategy, national computer incident/emergency response teams and legislation
- Target 3.2: By 2023, increase the global e-waste recycling rate to 30%
- Target 3.3: By 2023, raise the percentage of countries with an e-waste legislation to 50%

- Target 3.4: By 2023, net telecommunication/ICT-enabled Greenhouse Gas abatement should have increased by 30% compared to the 2015 baseline
- Target 3.5: By 2023, all countries should have a National Emergency Telecommunication Plan as part of their national and local disaster risk reduction strategies

Goal 4 – Innovation: Enable innovation in telecommunications/ICT in support of the digital transformation of society.

The Union recognizes the crucial role of telecommunications/ICTs in the digital transformation of society. The Union seeks to contribute to the development of an environment that is conducive to innovation, where advances in new technologies become a key driver for the implementation of the WSIS Action Lines and the 2030 Agenda for Sustainable Development.

- Target 4.1: By 2023, all countries should have policies/strategies fostering telecommunication/ICT-centric innovation

Goal 5 – Partnership: Strengthen cooperation among the ITU membership and all other stakeholders in support of all ITU strategic goals.

In order to facilitate the achievement of the above strategic goals, the Union recognizes the need to foster engagement and cooperation among governments, the private sector, civil society, intergovernmental and international organizations, and the academic and technical communities. The Union also recognizes the need to contribute to the global partnership to strengthen the role of telecommunication/ICTs as means of implementation of the WSIS Action Lines and the 2030 Agenda for Sustainable Development.

- Target 5.1: By 2023, increased effective partnerships with stakeholders and cooperation with other organization and entities in the telecommunication/ICT environment. `

409. Each year, the World Telecommunication and Information Society Day (WTISD) theme is also linked to the Connect 2030 Agenda goals and targets, the SDG's and the WSIS Action Lines so as to continue to promote and raise awareness about the possibilities that the use of the Internet and other information and communication technologies (ICTs) can bring to societies and economies, as well as of ways to bridge the digital divide.

Operationalization of the ITU Strategic Plan 2020-2023

410. The ITU secretariat contributed to the progress towards the Connect 2030 Agenda through the implementation of the operational plans of the three Sectors and the General Secretariat.

Contribution of the Connect 2030 Agenda to the Sustainable Development Goals

411. In order for ITU to respond to the needs of its constituents with regards to the 2030 Agenda for Sustainable Development, the secretariat developed the 'ITU SDG mapping tool', aiming to provide a comprehensive visual overview of how the ITU strategic framework and Connect 2030 Agenda contribute to the Sustainable Development Goals (SDGs). The tool visualizes the mapping and the linkage of the ITU strategic framework, Connect 2030 Agenda, WSIS Action Lines and the SDGs and Targets. It is also now linked to the WSIS Stocktaking DB and allows for third parties to publish success stories.

Example: Three map of SDG mapping to ITU activities:

Example: Three map of SDG mapping to activities on the WSIS Stocktaking DB:

Roadmap for 2030

412. ITU will further advance the implementation of Connect 2030 by:

a) *Measurement, monitoring and reporting*: Effective measurement and data analysis is key in meeting the needs of policy-makers and practitioners. Further work required in specific cases to define measurement methodologies will be continued.

b) *Coordinated implementation of the ITU strategic and operational plans contributing to the Connect 2030 Agenda: Ensuring inter-sector coordination on the cross-sectoral thematic areas covered by the Connect 2030 Agenda goals and targets will ensure maximizing the impact of ITU's work.*

(m) Broadband Commission for Sustainable Development

413. The Broadband Commission for Sustainable Development was established May 2010 by ITU and UNESCO in response to calls by the UN Secretary-General Mr. Ban Ki-moon to step up efforts by the UN to accelerate progress towards the MDGs. The Commission is grounded in the belief that universal connectivity is key to achieve the Sustainable Development Goals (SDGs). Acting as the UN advocacy engine for implementation of the UNSG's Roadmap for Digital Cooperation and leveraging the strength of its membership and collective expertise, the Commission's work advocates for meaningful, safe, secure, affordable and sustainable broadband communications services that are reflective of human and children's rights.

414. The Broadband Commission for Sustainable is led by President Paul Kagame of Rwanda and Carlos Slim Helù of Mexico and is co-chaired by ITU's Secretary-General Houlin Zhao and UNESCO Director-General Audrey Azoulay. It is comprised of over 50 Commissioners representing a cross-cutting group of top CEOs and industry leaders, senior policymakers and government representatives, and experts from international agencies, academia and organizations concerned with development. Its mission is to catalyze the expansion of broadband connectivity globally to enhance quality of life, power sustainable development, and accelerate the achievement of the of the United Nations' SDGs by 2030.

415. The Broadband Commission believes that high-speed, high-capacity broadband connectivity to the Internet is essential in modern society, with wide economic and social benefits. It aims to promote the adoption of broadband-friendly practices and policies, so the entire world can take advantage of the benefits. It defines strategies for accelerating broadband roll-out worldwide and examines applications that could see broadband networks improve ICT delivery in healthcare, education, environmental management, safety and across society.

416. Every year, the ITU/UNESCO Broadband Commission for Sustainable Development publishes its flagship annual 'State of Broadband' report in September to take the pulse of the global broadband industry and to explore progress towards universal connectivity and make progress towards realizing the Commissions 7 Advocacy Targets. This year, the Commission continued to observe acceleration in the adoption and innovation around broadband as a result of the COVID-19 pandemic. Communities across the globe have adapted to the new realities of work from home, hybrid education models and e-commerce. However, in 2022, 2.7 billion people still do not have access to the internet, with affordability being a critical challenge. The work of the Broadband Commission in 2022 has

responded to these challenges through addressing the most pertinent issues affecting broadband affordability, access and use.

417. Over the course of 2021 and 2022, the Broadband Commission pursued a range of topics through its Working Groups on: Smartphone Access, Virtual Health and Care, AI Capacity Building and Data for Learning, each of which launched a publication in 2022. t. The Commission Working Groups for the next year will be focused on, the continuation of the Data for Learning research and the smartphone access and affordability work, Digital Connectivity and MSMEs, among others.

418. By issuing these reports, the ITU/UNESCO Broadband Commission for Sustainable Development has developed thought leadership and made worthy contributions to the debate about how best to expand broadband access and services and achieve digital inclusion for all through innovative financing mechanisms. The Commission will continue working with many different stakeholders to fulfil its Universal Connectivity Manifesto dedicated to connecting the unconnected and realizing the forthcoming SDGs and the 2030 Agenda. In addition, in 2022, The Commission issued an Open Statement to the Transforming Education Summit, held in New York, highlighting the role of the universal and affordable broadband connectivity to realize the SDG4 – quality education. The Commission called for the public and private cooperation across all sectors and geographies to unlock the power of digital learning by supporting digital transformation that delivers affordable and inclusive connectivity for the most marginalized learners, teachers and families.

419. In addition to these reports, the Commission maintains an online inventory, housing a wealth of digital resources, country case studies, best practices and regulatory recommendations, in addition to releasing its publicly available newsletter.

420. In addition to its Working Group activities, the Broadband Commission, hosts two regular face-to-face meetings each year, in some cases virtual, to solicit feedback from regional constituents, including ministers and regulators, as well as members of the private sector and UN high level representatives. At these bi-annual meetings, Broadband Commissioners debate key issues to advance the work of the Commission, present findings and recommendations from their work throughout the year, offer expertise and guidance to high-profile guests and launch global calls to action like the 2020 Universal Connectivity Manifesto.

421. On 5 June 2022, in Kigali, Rwanda, the Commission reconvened its in-person meeting, on the side-lines of ITU's World Telecommunication Development Conference (WTDC) to discuss the power of digital transformation to create broad and positive socio-economic impact and looked at ways to rapidly increase access to broadband, foster innovative partnerships, empower youth, and build trust in online spaces. In particular, the Commissioners confronted chronic connectivity challenges and discussed how to ensure affordable, sustainable, and equitable access to digital services across regions, especially in the world's 46 Least Developed countries, where 17% of the population is still without a mobile broadband signal, and hundreds of millions more kept offline by high prices, lack of digital skills and awareness, and a dearth of usable, relevant and accessible content.

422. On 18 September 2022, the Commission held its Annual Fall Session hosted by UNIC, titled Accelerating broadband for new realities. The meeting, convened ahead of the U.N.'s Transforming Education Summit at the opening of the 77th Session of the U.N. General Assembly, the Commission called for universal, inclusive and affordable connectivity for the digital transformation of education. Among other topics, participants discussed how connectivity and technological innovations are enabling swift adaptation to hybrid education; empowering learners through open education resources and data; building capacities of civil servants for effective digital transformation; and providing platforms for strengthening the literacy necessary for navigating digital spaces. The meeting also served as a platform for Commissioners to share progress through the flagship State of Broadband Report, Working Groups publications.

423. This meeting reaffirmed the Commission's call for digital cooperation, innovation with ICTs, and collaborative approaches to secure universal connectivity and access to digital skills.

(n) AI for Good Global Summit

Introduction

424. The AI for Good Global Summit series identifies practical applications of AI with the potential to accelerate progress towards the SDGs. Close to 40 UN organizations are partners of the AI for Good Global Summit. Now in its fourth edition, this year's AI for Good Global Summit is being held online all year, and will continue to connect AI innovators with public and private-sector decision-makers in the interests of stimulating the discovery and delivery of "AI for Good" solutions for all. The AI for Good series has been arranged into three streams (Build, Learn, Experience) with the following service offerings:

Build:
- AI for Good Breakthroughs
- AI for Good Innovation Factory
- AI for Good Machine Learning 5G Challenge
- AI for Good Repository

Learn:
- AI for Good Keynotes
- AI for Good Webinars
- AI for Good Perspectives
- AI for Good On the Go!

Experience:
- AI for Good Artistic Intelligence
- AI for Good Demos

425. Following TSAG discussions on the matter in September 2019 (see TSAG-R8), a roundtable was convened at ITU headquarters on 30-31 January 2020 to discuss the mission and composition of a Global Initiative to support the implementation of beneficial AI-based solutions to accelerate progress towards the SDGs.

Attended by around 100 participants (including AI specialists, data owners, and infrastructure providers from the private sector, academia, governments, UN agencies

and standards bodies), the roundtable highlighted the need for the Global Initiative to maximize collaboration in order to:

- Match problem owners with providers of solutions using AI and data
- Scale and sustain AI-based projects
- Make available and accessible capabilities, resources, datasets, know-how, guidelines, frameworks and standards as a common good

At the roundtable, two working groups (on repositories and on marketplaces) were established and one project was identified (Global AI services platform, initially introduced at an AI for Good Global Summit) to progress toward achieving the mission of the Global Initiative, summarized here.

426. On 16 July 2020, as part of the AI for Good webinar series, the Global Initiative launched the Global Data Pledge project to help identify, support and make available data as a common global resource.

(o) Girls in ICT Day

427. On 28 April, ITU celebrated International Girls in ICT Day, observed annually during the last week of April, with a focus on 'Access and Safety' as key elements to engage the next generation with information and communication technology (ICT). The global celebration and associated worldwide Girls in ICT Day events underline ITU's commitment to encourage girls and young women everywhere to consider pursuing STEM career paths. An interactive global dialogue hosted on 28 April on ICT access and safety for girls took place as part of the 2022 World Summit on the Information Society (WSIS) Forum. ITU regional offices held Girls in ICT Day events to encourage girls and young women everywhere to learn about technology and find STEM career paths.

428. During regional virtual and hybrid events in the Arab States, Africa, the Americas, CIS and Europe on 28 April, women regulators and ministers within the Network of Women for the World Telecommunication Development Conference (WTDC) connected with young women to share their experiences and inspire them to continue or start a career in tech.

429. In Africa, the ITU Regional Office for Africa participated in the Girls in ICT Day celebrations in collaboration with the African Telecommunication Union (ATU) and the UNICEF Liaison Office to the African Union Commission, held on 25 and 27 April respectively. Discussions focused on the challenges of access and safety online for girls and young women, and how to promote their active participation in ICTs. On 28 April, the Africa Regional Girls in ICT Day was organized in coordination with youth envoys from the Generation Connect and the Africa Network of Women, together with a national physical event in Addis Ababa with close to 100 young girls in attendance, during which the challenges and opportunities in safely accessing the internet were discussed in line with the theme of the day.

430. In Asia, Thailand's National Broadcasting and Telecommunication Commission and the Ministry of Digital Economy and Society worked with the ITU Asia and the Pacific Regional Office to organize celebrations on 28 April, as well as events and training programmes throughout June.

431. In the Arab States, the Girls in ICT Day 2022 celebration powered by Network of Women for WTDC for the Arab region was held on 28 April with a special focus on encouraging girls and young women to meaningfully utilize ICTs.

432. In the CIS Region, a hybrid Fireside Discussion was held to celebrate Girls in ICT Day on 28 April, supported by the Network of Women for WTDC. The event was part of a wider Girls in ICT Day celebration in Uzbekistan, where a digital learning centre for women and youth was opened, organized by the Regional Office for CIS in partnership with Uzbekistan.

433. In the Americas, Generation Connect and the Network of Women for WTDC collaborated to celebrate Girls in ICT Day.

(p) Equals in Tech Awards -2022

434. The EQUALS in Tech Awards, hosted by the EQUALS Global Partnership, recognize innovative solutions aimed at closing the digital gender gap. The nominations for the ninth EQUALS in Tech Awards 2022 was open in April 2022 and 160 nominations were received from 54 countries representing the private sector, civil society, governments and academia. The ceremony of the awards will be held at ITU-HQ in Geneva, Switzerland on 8 December 2021.

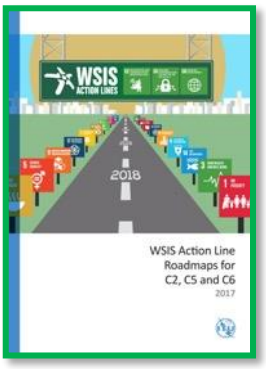
(q) Roadmaps for WSIS Action Lines C2, C5, C6

435. In line with its mandate and the WSIS outcome documents, the ITU continues to play a key role in the WSIS implementation and follow-up process, in particular, as the WSIS Action Lines Sole Facilitator for AL C2 (Information and Communication Infrastructure), AL C5 (Building Confidence and Security in the Use of ICTs), and AL C6 (Enabling Environment).

436. With the aim of strengthening the implementation mechanism, ITU Council 2009 agreed on the framework for roadmaps of ITU's activities in its role as the sole facilitator for the above mentioned WSIS Action Lines in the implementation of WSIS up to 2015. Highlighting the important role of ITU in implementing the WSIS Action Lines until 2025, revised resolution 1332 in para 3 under resolves instructs us to do the following with regard to the roadmap:

    1. updating its WSIS Action Line Roadmaps for C2, C5, and C6 to account for activities underway to also achieve the 2030 Agenda for Sustainable Development;

    2. providing input, as appropriate*, into the roadmap/work plans of WSIS Action Lines C1, C3, C4, C7, C8, C9 and C11, also related to the 2030 Agenda for Sustainable Development.*



437. Roadmaps are detailed plans to guide progress towards achieving WSIS goals, also related to the 2030 Agenda for Sustainable Development. They provide broad vision and detailed overview of the activities planned within the mandate of the Union. Direct links between the activities and the strategic goals and relevant resolutions, programmes and initiatives of the ITU are highlighted. The roadmaps include timeframes, expected results, impact on ITU's human and financial resources as well as list of relevant partners.

438. Elaborated framework may serve as a template for the other WSIS Action Line moderators/facilitators to strengthen the implementation mechanism of WSIS process. It has been widely disseminated amongst the WSIS Action Line Facilitators, members of the United Group on the Information Society as well as WSIS stakeholders. The Roadmaps can be accessed at www.itu.int/itu-wsis.

439. At its 34th ITU Council Working Group (CWG) on WSIS&SDG in September 2019, the Secretariat was requested to provide information on the implementation of activities that have already expired, by including a new section and linking them to previous reports and to include the work plans of WSIS Action Lines C1, C3, C4, C7, C8, C9 and C11, into the ITU Roadmaps document. At its 35th CWG on WSIS&SDG in December 2019, the Secretariat was requested to analyze the implementation of the WSIS outcomes for Action Lines C2, C5 and C6, and the achieved results in the ITU Roadmaps document.

440. At the 36th CWG on WSIS&SDG meeting on 28-29 January 2021, the Group endorsed the revised template for ITU Roadmaps C2, C5 and C6 and recommended to use them for analyzing the implementation and achieved results of the WSIS outcomes for the Action Lines C2, C5 and C6.

441. At the 38th CWG on WSIS&SDG meeting on 19-20 January 2022, the Secretariat was requested to finalize arrangement of ITU as the lead facilitator of WSIS Action Line C4 (Capacity Building), and report to Council 2022.

(r) Communication and Outreach

442. WSIS Flash: is a monthly newsletter on WSIS Related news, projects and activities. https://www.itu.int/net4/wsis/stocktaking/Flash/Newsletter

443. iwrite4WSISForum is a campaign that aims to empower stakeholders to write and report on all WSIS related events and activities, sharing their work and ideas with thousands of WSIS stakeholders online worldwide. This twitter campaign was introduced for effective and far reaching communication for and amongst WSIS Stakeholders. This empowers all the WSIS Stakeholders to become WSIS reporters and tweet information about their projects and community. http://www.wsis.org/iwrite

444. imeetyouatWSISForum provides all registered onsite participants of the WSIS Forum with an online social networking community experience. This component of the WSIS Forum has been specially designed for the WSIS Forum onsite participants. See here.

445. WSIS Process on Facebook: The WSIS Facebook page gives opportunity for stakeholders to get informed and actively contribute to the page: http://www.facebook.com/WSISprocess

446. @WSISprocess on Twitter: The WSIS Twitter page gives opportunity for stakeholders to get informed and actively participate at the page https://twitter.com/WSISprocess

447. WSIS Process on YouTube: WSIS Forum highlights, interviews and all the important WSIS Related Videos are available on the WSIS Forum You Tube site: http://www.youtube.com/wsisprocess.

448. WSIS Process on LinkedIn: WSIS Process has a LinkedIn group: https://www.linkedin.com/groups/WSIS-Process-World-Summit-on-2599279?gid=2599279&trk=hb_side_g .

449. WSIS in ITU News: The ITU News is a media partner of the WSIS Process and regularly publishes WSIS Process related articles in several issues https://itunews.itu.int/en/

450. WSIS is also on Instagram: the WSIS Process Instagram account allows to share pictures and videos and give the opportunity for the followers to comment and share them https://www.instagram.com/wsis_process/

(s) WSIS Fund in Trust

451. The WSIS Trust Fund was established in 2011 with the adoption of Plenipotentiary Conference Resolution 140. Council Resolution 1332 as modified by ITU Council in May 2016 takes into account the outcomes of the United Nations General Assembly Overall Review of the Implementation of WSIS Outcomes and the 2030 Agenda for Sustainable Development, and resolves to maintain the fund to support ITU activities to facilitate the implementation of WSIS outcomes, calls for partnerships and strategic alliances, and invites the ITU Membership to make voluntary contributions to the fund.

452. Since its creation, information on the WSIS Trust Fund and stakeholder contributions has been reflected at the dedicated website: www.itu.int/itu-wsis/fund. This provides an opportunity to thank all those who have contributed towards the Trust Fund to date for their dedication and commitment towards WSIS Implementation, in particular the WSIS Forum. Moving towards 2025, and following the multistakeholder approach, the WSIS Forum will build upon the outcomes of the WSIS+10 Review and the 2030 Agenda for Sustainable Development.

453. The ITU would like to thank all WSIS stakeholders who have generously contributed to the WSIS Fund in Trust, the names of all contributors are reflected in the dedicated site of the WSIS Fund in Trust http://www.itu.int/en/itu-wsis/Pages/WSIS-Fund-in-Trust.aspx

454. We thank United Arab Emirates, Saudi Arabia, Qatar, Japan, IEEE, Huawei, Rwanda, Switzerland, Internet Society, Ernst&Young, United Kingdom, IFIP, and Global Coalition on Aging for their contributions to the WSIS Fund in Trust in 2022 to accelerate the implementation of the WSIS related activities undertaken by ITU.

(t) Future Actions

455. The WSIS Forum 2023 is scheduled to be held from 13 to 17 March 2022 at the ITU Headquarters premises in Geneva, with remote participation. Virtual sessions will continue

in April and May 2023. Please find out more on the WSIS&SDG activities and events (2022-2023) on our calendar of events that is available online here.

456. **1) WSIS Forum 2023 (Open Consultation Process) www.wsis.org/forum**

- Phase I: 7 September 2022, 13:00-14:00 CEST, Virtual Launch of the Open Consultation Process (OCP)
    - Launch of the WSIS Forum 2023 website for the Official Submissions to the WSIS Secretariat on the thematic aspects and innovations on the format to be made via www.wsis.org/forum
    - Open call for nominations for WSIS Forum 2023 multistakeholder High-Level Track Facilitators
    - Launch of the WSIS Special Initiatives, WSIS Prizes, WSIS Photo Contest 2023
- Phase II: 30 November 2022, 11:00-12:00 CET/12:00-13:00 EAT: 1st Meeting: Open Forum on Implementation of WSIS Action Lines and WSIS Forum (during IGF 2022 in Addis Ababa, Ethiopia).
- Phase III: 13 January 2023, 14:00-15:00 CET: 2nd Meeting of OCP (Room A, ITU Headquarters, Geneva, Switzerland with remote participation).
- Phase IV: 1 February 2023, 13:00-14:00 CET: Special WSIS Forum 2022 Chairman Session (WSIS+20: Highlighting the achievements and challenges of the WSIS Action Lines for achieving the SDGs) and Deadline for Submissions of Official Contributions and Binding Requests for Workshops.
- Phase V: 13 February 2023, 14:00-15:00 CET: 3rd Meeting of OCP (Room A, ITU Headquarters, Geneva, Switzerland with remote participation).

457. Please refer to www.wsis.org/forum for updates. The Open Consultation Process will include a collection of inputs from regional and national WSIS related events and the physical meetings of the Open Consultation Process will benefit from remote participation.

458. **2) WSIS Prize 2023- Phases – www.wsis.org/prizes**

The contest is organized into five phases:

FIVE PHASES OF THE CONTEST

- The first phase: Submission phase 7 September 2022 – 7 December 2022 (Deadline for last submission: 23:00 Geneva time).
- The second phase: Nomination Phase. Revision of submitted projects that will result with a list of 360 nominated projects, twenty (20) projects per Action Line Category (18) 13-23 December 2022 (twenty projects per each category will be nominated).

- The third phase: Public online voting (identification of five projects per category with the highest number of votes) 25 December 2022 – 25 January 2023 (Deadline for casting last vote: 23:00 Geneva time).

- The fourth phase: Selection of winning projects by the ITU Expert Group that will result with a list of winning projects 25 January – 10 February 2023.

- The fifth phase: Announcement of winners to the public during WSIS Prize 2023 Ceremony at WSIS Forum 2023 (13-17 March), and the release of publication "WSIS Stocktaking: Success Stories 2023", which is a compilation of extended descriptions of the awarded projects.

Phase one will open the call for submissions to the contest of the WSIS Prize 2023 at www.wsis.org/prizes. During the period from 7 September until 7 December 2022, all stakeholders are invited to submit WSIS related projects to the WSIS Prize 2023 contest. In order to process the submission, stakeholders are requested to complete the submission form online at www.wsis.org/prizes.

The contest is open to all stakeholders, entities representing governments, private sector, international and regional institutions, civil society, and academia. No more than one project from the same entity is allowed to be submitted per category. Stakeholders are invited to consult the rules for project submission and nomination criteria at the WSIS Prizes website. All WSIS stakeholders are encouraged to submit ICT projects for which they believe should be recognized and promoted, and for which they do not necessary hold ownership of.

The eighteen Winners and Champions will be recognized at the WSIS Forum 2023, to be held from 13 to 17 March 2023. The winning projects will be showcased in the WSIS Stocktaking: Success Stories 2023 publication, while all submitted descriptions of projects and activities will be reflected in the WSIS Stocktaking Report 2023. We invite all WSIS Stakeholders to participate in the contest of WSIS Prizes 2023.

459. **WSIS Stocktaking: 2022-2023 Year-around Call for Update and New Entries is OPEN**

www.wsis.org/stocktaking

460. The WSIS Stocktaking process has been maintained by ITU since 2004 as requested by the WSIS Outcomes (Tunis Agenda for the Information Society, Para 120). This publicly accessible WSIS Stocktaking database (www.wsis.org/stocktaking), currently with more than 12,000 entries and a growing community of 300,000 stakeholders, is a unique global tool for collecting information and regular reporting on information and communication technologies related initiatives and projects, carried out by governments, international organizations, the private sector, civil society, academia and other entities, in the context of 11 WSIS Action Lines.

461. In 2015, the UN General Assembly within the framework of the ten-year review of the WSIS (Res. A/70/125) called for a close alignment between the WSIS process and the 2030 Agenda for Sustainable Development (Res. A/70/1). The WSIS Stocktaking process responded by highlighting the contribution of 11 WSIS Action Lines to the achievement of 17 Sustainable Development Goals (SDGs).

462. The United Nations Economic and Social Council (ECOSOC) Resolution 2019/24 on "Assessment of the progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society" reiterates the importance of sharing best practices at the global level, and, while recognizing excellence in the implementation of the projects and initiatives that further the WSIS goals, encourages all stakeholders to submit ICT-related projects and initiatives to the WSIS Stocktaking platform.

463. We are pleased to invite you to update and submit new entries online at the WSIS Stocktaking page https://www.itu.int/net4/wsis/stocktaking/Project/Projects/Submit.

464. Submitted activities will be reflected in the WSIS Stocktaking Report 2023, which will be released at the WSIS Forum 2023 from 13 to 17 June 2023 in Geneva, Switzerland.

465. WSIS Forum 2023 Photo Contest: Participate in building a collage of photographs from around the world demonstrating how ICTs are playing an enabling role in achieving the Sustainable Development Goals.

466. Following the success of the previous editions of the WSIS Forum Photo Contest, we are pleased to announce another successful edition of WSIS Photo Contest 2022 that was launched on 19 August 2021, inviting the community to picture how are ICTs advancing SDGs on the ground, therefore contributing to WSIS Stocktaking overall. The submissions were carefully reviewed and 3 winning photos were selected and announced. Find all finalists and winners at the WSIS Photo Contest page https://www.itu.int/net4/wsis/forum/2022/PhotoContest. The photos submitted from the finalists were exhibited during the WSIS Forum 2022 final week and displayed on the virtual exhibition at the WSIS Forum 2022 online networking platform ImeetyouatWSIS and will be also promoted in WSIS-related events.

467. All WSIS stakeholders are invited to use the photos of the WSIS Photo Contest in publications, websites, social media etc and thus promote the ICT work for social impact and Sustainable Development. Should you have any questions or need for assistance, please do not hesitate to contact the WSIS team at wsis-photocontest@itu.int. We invite all to continue submitting photos through the WSIS Stocktaking platform and WSIS Forum website. Three winning entries will be awarded and presented at the WSIS Forum 2023.

(VI) Final conclusions

468. The ITU is committed to connecting the world in its role as one of the lead facilitating organizations for the WSIS Process. In 2022, ITU initiated, facilitated and implemented a number of activities and projects related to the implementation of the WSIS outcomes showcasing direct linkages with the SDGs. ITU has a number of new initiatives in response to COVID-19 and work programmes that are increasingly relevant in the current situation. The ITU COVID-19 Updates webpage highlights all ITU initiatives, events, products, and partnerships related to COVID-19. The three ITU sectors, Radiocommunication (ITU-R), Standardisation (ITU–T), Development (ITU-D), and the General Secretariat were active in this process in their respective areas of expertise, and worked to create an environment and opportunities for multistakeholder cooperation in line with the goals of WSIS.

469. For the last 20 years, WSIS Process and its components, specially the Forum has proven to be an efficient global multi-stakeholder platform that is open and inclusive for all to

exchange knowledge and information, enhance collaborative networks, and to share best practices in the ICTs sector.

470. As the leading UN specialized agency focusing on ICTs and in collaboration with Stakeholders, ITU has been highlighting the role of ICTs (WSIS Action Lines) and their contribution to the social, economic and environmental development and the fight against COVID-19 to help build back better.

471. Building upon the outcomes of the UN Summit on Sustainable Development and the UNGA Overall Review on the Implementation of the WSIS Outcomes, both held in 2015, the alignment of these processes is ongoing and with strengthened efforts by all stakeholders at all levels – national, regional and global – in order to ensure that the enabling power of ICT is leveraged for achieving the SDGs by 2030.