ITU Contribution to the Implementation of the WSIS Outcomes: 2020

Draft Zero

as of 7/12/2020

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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 Plan 2020-2023 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-18, which took place in Dubai from 29 October to 16 October 2018 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.

4. 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.

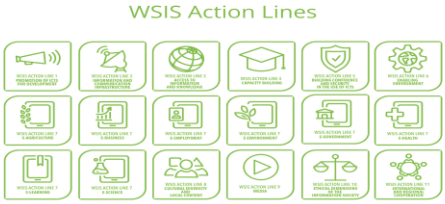
5. Within the ITU, the WSIS Implementation and follow up activities of all three Sectors and the General Secretariat are reflected in this annual report titled ITU's Contribution to the Implementation of the WSIS Outcomes. ITU's Contribution to the Implementation of the WSIS Outcomes is a comprehensive 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 Measurement.
   (f) Facilitator of the WSIS Stocktaking Process.
   (g) Initiator and facilitator of the WSIS Project Prize.
   (h) Implementor of other WSIS outcomes.

6. 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.

7. 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 2020 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



8. In line with resolution 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) 2020[1]

9. The **2020 High Level Political Forum (HLPF**), convened under the auspices of the Economic and Social Council, met virtually from 7 to 16 July, under the theme "Accelerated action and transformative pathways: realizing the decade of action and delivery for sustainable development". In light of the ongoing COVID-19 pandemic, the Forums attention and discussions also focused on the impact of COVID-19 on the SDGs.

10. The meeting brought together the Prime Ministers of Norway and India, over 100 Ministers and Vice-Ministers as well as hundreds of policy makers from around the world, along with Members of Parliament, NGOs, think tanks, academia, business sector and the UN system. There were more than 200 official side events; seventeen VNR Labs; nine special events providing platforms for different communities engaged around the 2030 Agenda such as local and regional governments, chief sustainability officers, higher education experts, volunteers and parliaments (attracting over 6,000 participants); and 10 virtual exhibitions. In total, it is estimated that these meeting attracted more than 72,000 live views.

11. Forty-seven countries presented Voluntary National Reviews (VNR). Many countries informed they had speeded up the integration of the 2030 Agenda into their development plans and into different sectors. In general, many countries have adjusted their strategies and aligned budgets to achieve the SDGs. Many strengthened or created new institutions to support the implementation of the SDGs. At the same time, countries underlined numerous challenges. Those included poverty; access to quality education; social inequalities; unsustainable consumption and production patterns; climate action; biodiversity; overfishing and vulnerability to natural disasters; gender inequality and gender-based violence; ineffective monitoring and evaluation systems; lack of data especially for identifying those being left behind, limited technical and financial capacities, as well as the digital divide.

12. In terms of the critical role of ICTs, all VNR reports make reference, in one way or another, on the importance of digital technologies and access to the Internet for achieving the SDGs. Many countries alluded in their oral presentations to digital solutions to cope with the

[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.

COVID-19 crisis and the need to bridge the digital divide. Internet accessibility, e-education and distance learning, e-governance, telemedicine and cyber security issues emerged as recurring key references.

13. Key ITU inputs and activities included the following:

Inputs:

- ITU Council contribution to HLPF 2020
- Partnership on Measuring ICT for Development input
- United Nations Group on the Information Society (UNGIS) input
- World Summit on the Information Society Forum Outcomes
- Broadband Commission for Sustainable Development

Statements/Interventions:

- ITU Secretary-General's statement in the General Debate of the Ministerial segment and the High-level segment of the UN Economic and Social Council (ECOSOC)
- Statement delivered by Chief of SPM Department under thematic session on "Science, technology and innovation"
- ITU commented under the thematic discussion on "Are we leaving no one behind in eradicating poverty and working towards the 2030 Agenda?"

Side and Special events:

- 6 July, 12:00 - 4:00 pm - Webinar on the 2020 targets (On the eve of HLPF during ECOSOC Integration Segment)
- 8 July, 09:00 - 10:30 am, Special Event - SDG learning session on "Accelerating action through digital technologies: strengthening digital skills and capacities for human wellbeing" ITU, UNITAR
- 8 July, 12:00 - 13:30 pm, side event "Digital with Purpose: Accelerating action and transformative pathways for delivering on the sustainable development goals and recovery from COVID-19 Pandemic" with GeSI & the United Nations Office for South South Cooperation (UNOSSC); Video here
- 9 July, 12:00 - 13:30 pm, side event "Pathways towards universal access to resilient connectivity in the LDCs and landlocked countries" - Broadband Commission for Sustainable Development with UNORHLLS. Video here.
- 14 July, 08:00 - 09:00 am, UNDP side event "Half the World: The Many Faces of Social Protection," ITU SG's 2-minute video statement featured during the event)
- 15 July, 10:00 - 11:00 am, ITU/Saudi Arabia side event with the engagement of the UN Group on the Information Society (UNGIS): Information and Communication Technologies and Digital Transformation for Building Back Better and Accelerating SDG Achievement: "Implementation of the WSIS Action Lines in Covid-19 Response and SDG Decade of Action".

Inputs to UN Reports:

- UNSDG's Progress towards the Sustainable Development Goals

- Synthesis of voluntary submissions by functional commissions of the Economic and Social Council and other intergovernmental bodies and forums
- 2020 Financing for Sustainable Development Report

Inter-Agency Task Team (IATT) - Background Thematic papers on:

- Sharing economic benefits
- Bolstering local action to accelerate implementation
- Protecting the Planet and Building Resilience
- Science, technology and innovation

ICT Accelerated Actions

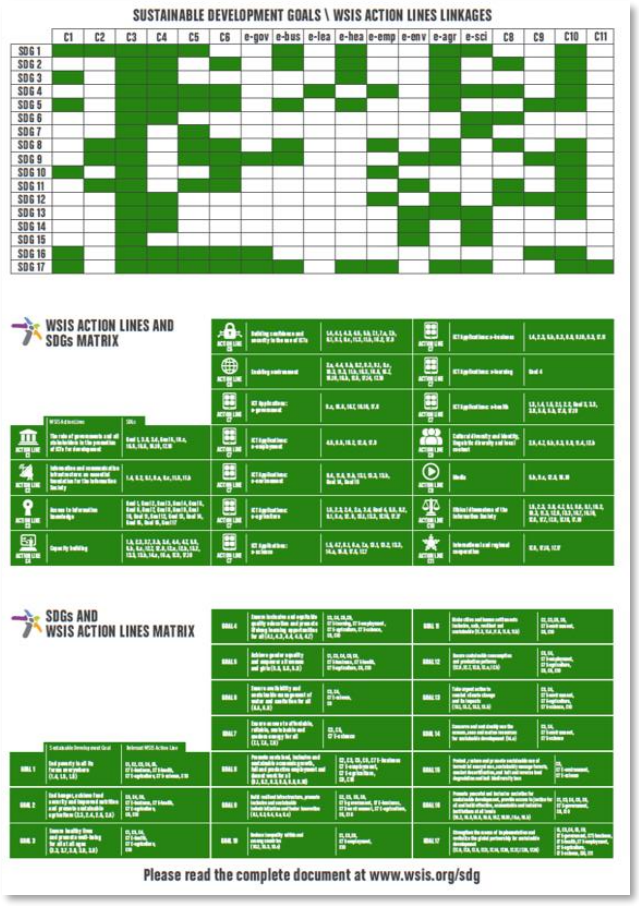
- "WSIS Stocktaking: The Coronavirus (COVID-19) Response – ICT Case Repository"
- #REG4COVID
- WSIS TalkX virtual conversations on ICTs and COVID19
- Virtual WSIS Forum 2020 relevant sessions

Other

- Online database of implementation of the SDG by the un system | administered by DESA https://sustainabledevelopment.un.org/content/unsurvey/index.html

(b) WSIS Action Lines and SDG Matrix

14. 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.

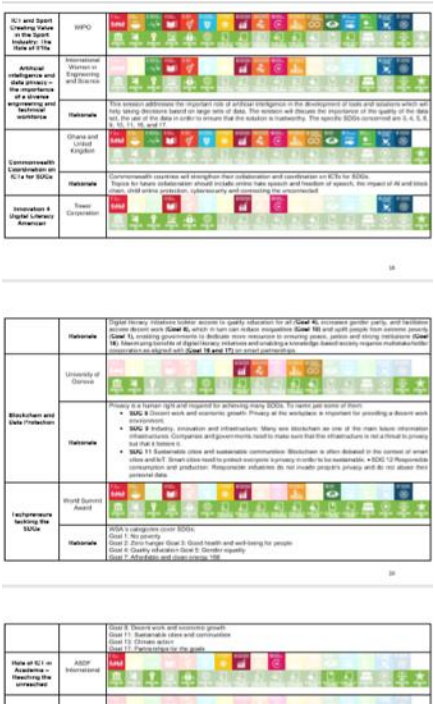


15. The mapping exercise draws direct linkages of the WSIS Action Lines with the proposed SDGs to continue strengthening the impact of ICTs for sustainable development. Each UN Action Line Facilitator has analyzed the connections and relations of their respective Action Line with the proposed SDGs and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

16. 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.

17. 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

18. **WSIS Forum 2020 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.



19. 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.

20. In this regard, the **WSIS Prizes 2020** contest aligned its rules to highlight the linkage between the WSIS Action lines and SDGs, this approach will be strengthened in 2021.

III. Overview of ITU activities and projects undertaken since 2020 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*.

21. 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.

22. 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.

23. The 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 (UNDESA, FAO, UNEP, WHO, UN Women, WIPO, WFP, ILO, WMO, ITC, UPU, UNODC, UNICEF 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.

24. 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.

25. 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.

8. **WSIS Forum 2009:** http://www.itu.int/wsis/implementation/2009/forum/geneva/
9. **WSIS Forum 2010**: http://www.itu.int/wsis/implementation/2010/forum/geneva/
10. **WSIS Forum 2011**: http://www.itu.int/wsis/implementation/2011/forum/
11. **WSIS Forum 2012**: http://www.itu.int/wsis/implementation/2012/forum/

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14. **WSIS Forum 2015**: http://www.itu.int/wsis/implementation/2015/forum/
15. **WSIS Forum 2016:** http://www.itu.int/wsis/implementation/2016/forum/
16. **WSIS Forum 2017:** http://www.itu.int/net4/wsis/forum/2017/
17. **WSIS Forum 2018:**https://www.itu.int/net4/wsis/forum/2018/
18. **WSIS Forum 2019:** https://www.itu.int/net4/wsis/forum/2019/
19. **WSIS Forum 2020:** https://www.itu.int/net4/wsis/forum/2020/

26. 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

27. WSIS Forum 2020 was hosted online by ITU under the overaching theme *Fostering digital transformation and global partnerships: WSIS Action Lines for achieving SDGs*. The Forum started on 22 June till September and 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 Virtual WSIS Forum 2020 took place on 7-10 September 2020, consisted of policy statements, interactive high-level dialogues, a WSIS Prize ceremony, a ministerial round table as well as the closing ceremony. The Forum garnered a lot of interest and excitement worldwide – with a cumulative attendance of over 15,000 attendees from around 150 countries who took part in about 160 virtual sessions with 846 different speakers. The virtual sessions were organised by WSIS stakeholders to highlight the role of ICTs in sustainable development More than 85 High-Level speakers representing Ministers, Heads of Regulatory Authorities, Private Sector, Civil Society, Academia and International Organizations contributed passionately towards the program of the Forum. 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.

28. The Chairman of the WSIS Forum 2020 was Dominican Republic. The high-level policy sessions were moderated by 11 High-Level Track Facilitators nominated and identified by the different WSIS Stakeholders types.

29. With the constant objective of strengthening the alignment of WSIS and SDG processes, the overall theme for WSIS Forum 2020 was "Fostering digital transformation and global partnerships: WSIS Action Lines for achieving SDGs". The concrete outcomes of WSIS Forum 2020 will enable stakeholders to strengthen implementation of WSIS Action Lines and the alignment of the WSIS and SDG processes. The many announcements, launches, agreements and commitments at this year's summit highlighted the progress relating to e-Government, cybersecurity, environmental impact, digital accessibility, COVID-19, education, gender equality and youth and older persons, ethics and wellbeing. The Forum's commitment to connect the unconnected has spearheaded many initiatives to enable everyone to benefit from digital technologies, wherever they are, and however they live. The press release resuming the outcomes can be found here.

30. WSIS Forum 2020 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.

31. The WSIS Forum 2020 Outcomes linked to WSIS Action Lines SDGs Sustainable Development Goals - Matrix Flyer can be consulted here.

32. The WSIS Forum 2020 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.

33. The WSIS Stocktaking Report 2020 can be found here. This document reflects around 1,062 activities relating to ICTs for development, submitted to the WSIS Stocktaking Platform from the 2nd July to 12th December, 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 2020 for Stocktaking updates and new entries. The inputs from WSIS action line facilitators and co-facilitators also contributed to the present Report.

34. The WSIS Stocktaking Success Stories 2020 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.

35. The WSIS Forum 2020: Report – WSIS Action Lines Contributing towards Accelerated action and transformative pathways: realizing the decade of action and delivery for sustainable development, can be found here. This document outlines the evolution of the respective WSIS Action Lines for fifteen years since 2015 towards the achievement of the SDGs, in particular in line with the theme of the High level Political Forum 2020.

36. The WSIS Forum 2020 organised Special Tracks during the Forum, including:

- ICTs and Sports: to encourage the international community to promote Sport as an Enabler of Sustainable Development as well as the E-Sport component, highlighting the gaming industry for innovative technologies that bring positive social impact in a digitally connected world. .
- 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 new 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 Virtual WSIS Forum 2020. This track comprised of interactive sessions with different topics covering gender and ICTs issues.

Photographs: click here.

All WSIS Forum 2020 Outcomes, photos and videos documentation and highlights are available at www.wsis.org/forum.

37. The Open Consultation Process for the WSIS Forum 2020 was structured in six phases as follows:

- **Phase I: Opening of the Open Consultation**
  The virtual launch of the open consultations took place on Tuesday, 4 July 2019, 16:00–17:00. Open calls for the WSIS Forum 2020 were announced. More information available here: https://www.itu.int/net4/wsis/forum/2020/Home/Consultations
- **Phase II: First Physical Meeting**
  The first physical meeting of the Open Consultation Process was held on Thursday, 20 June 2019, 17:00-18:00 at the International Telecommunication Union Headquarters, Geneva, Switzerland.
- **Phase III: Second Physical Meeting**
  The second physical meeting of the Open Consultation Process was held on Wednesday, 27 November 2019, 15:00-16:00 at the Estrel Congress Centre, Berlin, Germany during IGF 2019.
- **Phase IV: Third Physical Meeting**

The third physical meeting of the Open Consultation Process was held on Friday, 7 February 2020, 15:30-16:30 at the International Telecommunication Union Headquarters, Geneva, Switzerland.

- **Phase V: Deadline for Submissions of Official Contributions and Binding Requests for Workshops** by 3 February 2020.
- **Phase VI: Final Brief Meeting**
  The final brief meeting of the Open Consultation Process was held on Friday, 28 February 2020, 14:00–15:30 at ITU Headquarters, Geneva, Switzerland.

A Special Briefing was held virtually on Thursday, 28 May 2020, 14:00-15:00 to brief all stakeholders on the new virtual format and programme of the WSIS Forum 2020.

38. The **WSIS Forum 2021** is scheduled to be held from 17 to 21 May 2021 at the ITU Headquarters, Geneva. The agenda and program will build on the basis of submissions received during the Open Consultation Process. Additional information about the WSIS Forum 2021 is available here and below in section V.

(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)

39. 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.

40. The 15th Action line C2 Facilitation Meeting was held on Friday, 28 August 2020 as an integral part of the WSIS Forum 2020. Based on proposals received during the WSIS Forum 2020 multistakeholder open consultation process, the theme for the Action Line Facilitation meeting was: "**Identifying Unconnected Population: Mapping the last mile."** The session discussed how to identify the unconnected. More specifically, it focused on the challenges of collecting and sharing and using reliable data. Participant discussed how to ease the process of collecting and using data for connecting the unconnected. More details on this session here.

41. The WSIS Prizes 2020 Winner for the Action Line C2 is the Digital Inclusion - Free WiFi, Agencia Digital de Innovación Pública, Mexico.

The objectives established by the current of Mexico City government (years 2019-2024), are related to the implementation of policies in technology, data management fields, openness, and connectivity for optimising digital governance and strengthening citizen rights. Toward those ends, two projects have been implemented, "Ciudad Segura," and "Ciudad Digital". They aim to optimize available resources and public spending, to enforce the principles of the protection of human rights, progressive rights, interaction, and digital and technological inclusion, openness, and freedom of access to ICTs.

In this context, the Mexico City Government is providing free wireless internet access at sites already hosting infrastructure through 14,588 Technology Video Surveillance systems (TVS), as well as 96 public sites (internet at a speed of 200 MB) and 150 points of Innovation, Freedom, Art, Education and Knowledge (PILARES, for its acronym in Spanish). These are distributed across the 16 boroughs in Mexico City and broadcast the WiFi signal that allows citizens to access the Internet for free.

At this moment, some 10,709 Wi-Fi access points have been enabled through TVSs. Likewise the 96 public sites are working and 84 PILARES are enabled. In addition, the Government is collaborating in developing and guaranteeing digital inclusion for the entire population.

Project website

https://datos.cdmx.gob.mx/explore/?sort=modified

Sustainable development goals related to this project

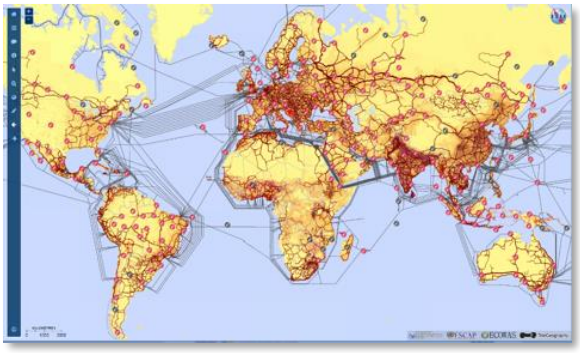
- Goal 8: Decent work and economic growth
- Goal 9: Industry, innovation and infrastructure
- Goal 11: Sustainable cities and communities

42. 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.

43. 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.

44. 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 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.



45. Implementation and updates of the ITU Interactive Terrestrial Transmission Maps (http://itu.int/go/Maps) 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.

46. At the time of this reporting, the Map presented information from 512 operator networks and 23,807 nodes worldwide. The research on the transmission links has reached 14,150,500 km of routes, of which 3,885,787 km have been imported to the Map. Submarine cables, information on IXPs and satellite earth stations have been updated.

47. In order to enhance the Interactive Terrestrial Transmission Map worldwide, ITU coordinated the data collection and validation process covering infrastructure of more than 170 countries.

48. 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.

49. 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.

50. 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.

51. 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

52. 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.

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

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

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

56. 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.

57. 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.

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

59. 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.

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

61. 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.

62. 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.

63. 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.

64. 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.

65. ITU is contributing to bridging the standardization gap between developing and developed countries. Instructed by PP-14 Resolution 123, WTSA-16 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).

66. 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 September 2019, ITU-T approved more than 415 texts (as of 3 November 2020), including ITU-T Recommendations, Supplements and Technical Reports.

67. Toolkit on Last Mile Connectivity is under development.

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

69. ITU-T Study Group 3 continues to study and develop Recommendations and guidelines regarding tariff and accounting principles and international telecommunication/ICT economic and policy issues.

- **Recommendation ITU-T D.264 "Shared uses of telecommunication infrastructure as possible methods for enhancing the efficiency of telecommunications"** proposes a set of possible methods to help telecommunication providers save costs and enhance efficiency through the shared uses of telecommunication infrastructure, including passive and active infrastructure sharing, including when enabled by aggregation of frequency bands assigned to operators who have acquired property rights over the spectrum to enable active infrastructure sharing implementation.
- **Recommendation ITU-T D.1040 "Optimizing terrestrial cable utilization across multiple countries to boost regional and international connectivity"** provides a collaborative framework that can be applied in order to promote optimal cable utilization across multiple countries and boost regional and international connectivity. The framework is based on a proportional allocation model, which allocates circuits based on the length of fibre contributed to the terrestrial multi-country end-to-end cable network.
- **Recommendation ITU-T D.1101 "Enabling environment for voluntary commercial arrangements between telecommunications network operators and OTT providers"** addresses the measures for strengthening the commercial cooperation between over the top (OTT) providers and telecom operators. Given that network operators and OTTs are part of the international telecommunication/ICT ecosystem, this Recommendation encourages relevant stakeholders to work towards an enabling regulatory environment that supports and encourages the development of innovative business models in line with the advancement of technology and innovations, which are changing faster than ever.
- **Recommendation ITU-T D.1140/X.1261 "Policy framework including principles for digital identity infrastructure"** sets out a policy framework including principles for digital identity infrastructure while recognizing the sovereign right of each Member State to regulate its telecommunications.
- **Recommendation ITU-T D.600R Annex B "Cost methodology for the regional tariff group for Africa applicable to the international automatic telephone service – Annex B: Guidelines for implementing efficient cost models for telecommunication service**

tariffs in the Africa region" (under approval) provides guidelines to Member States of the Africa region for the construction of costing model, within the framework of the approval of prices of telecommunication services, taking into account the technological development and innovation in the field of telecommunications as well as the specificity of each country.

- **Recommendation ITU-T D.607R "One Network Area Roaming" (under approval)** based on African regional experiences, aims to promote regional integration by bringing down the high cost of mobile roaming. It provides a framework and tools for facilitating and making affordable international telecommunications services to and from Africa's countries.
- **Recommendation ITU-T D.1041 "Policy and methodological principles for determining colocation and access charges" (under approval)**: offers policy and methodological principles for the Member States interested in establishing transparent co-location access and services rates. Co-location is an important telecommunications wholesale service essential to a competitive telecommunications landscape and a sustainable environment, as it eliminates the need for operators to build-out new or replicate existing infrastructure. A key component for encouraging co-location is the establishment of reasonable co-location access and service rates on the principles of fairness and equity.
- ITU-T D.Suppl.4 "Supplement 4 to ITU-T D-series Recommendations: ITU-T D.263 – Supplement on Principles for increased adoption and use of mobile financial services (MFSs) through effective consumer protection mechanisms" sets out a number of principles for encouraging adoption and use of MFS services through the establishment of adequate consumer protection mechanisms, such as information availability and transparency, quality of service, data protection and privacy, customer redress fraud prevention as well as contracts and disclosure guidelines.

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

- Recommendation ITU-T E.102 "Terms and definitions for disaster relief systems, network resilience and recovery" applies to disaster relief systems, network resilience and recovery. This Recommendation provides definitions of terms relevant to disaster relief systems, network resilience and recovery, including terms relevant to network architecture, functional elements and interfaces, application level aspects and power supply. Appendix I contains excerpts of the terminology defined by the United Nations International Strategy for Disaster Reduction (UNISDR). Appendix II shows the category classification of terms defined in this Recommendation.
- Recommendation ITU-T E.156 (revised) "Guidelines for ITU-T action on reported misuse of E.164 number resources" outlines the procedures for reporting and taking action regarding alleged misuse of numbers. It also outlines the procedures that the TSB Director should undertake upon receipt of reports of alleged misuse from members, including methods to address and counter any alleged misuse when such reports are brought to his attention.
- Recommendation ITU-T E.156 Amd.1 "Guidelines for ITU-T action on reported misuse of E.164 number resources – Amendment 1: Appendix IV: Suggested guidelines for regulators, administrations and operating agencies authorized by

Member States for dealing with number misappropriation" reproduces verbatim the attachment to WTSA Resolution 61 (Rev. Dubai, 2012) on "Suggested guidelines for regulators, administrations and operating agencies authorized by Member States for dealing with number misappropriation".

- Recommendation ITU-T E.164.2 (revised) "E.164 numbering resources for trials" contains the criteria and procedures for an applicant to be temporarily assigned a three-digit identification code within the shared ITU-T E.164 country code 991 for the purpose of conducting an international non-commercial trial. The purpose of the trial will be to determine the viability of a proposed new international public correspondence service.
- Recommendation ITU-T E.212 Amd.2 "The international identification plan for public networks and subscriptions - Annex G: Assignment of shared E.212 mobile country codes (MCC) for trials" contains the criteria and procedures for an applicant to be temporarily assigned a two digit mobile network code (MNC) within the shared E.212 mobile country code 991 for the purpose of conducting an international non-commercial trial.
- **Recommendation ITU-T E.212 (2016) Amd.3 "The international identification plan for public networks and subscriptions - Annex H: Criteria and procedures for the assignment and reclamation of shared ITU-T E.212 mobile country codes (MCC) for regional and other international organizations (ROIO)/standards development organization (SDO)-specified networks and their respective mobile network codes (MNCs)" (under approval)** provides criteria for assignment of shared E.212 resources for specific use cases to applicants that are regional and other international organizations (ROIO)/standard development organization (SDO)-specified networks.
- Recommendation ITU-T E.218 Amd.1 "Management of the allocation of terrestrial trunk radio Mobile Country Codes - Annex B: Criteria and procedures for the assignment and reclamation of shared ITU T E.218 terrestrial trunk radio access mobile country codes ((T)MCC) for networks and their respective terrestrial trunk radio access mobile network codes ((T)MNCs)" specifies the administration of global terrestrial trunk radio access mobile network codes by the ITU-T by detailing the scope of the resource covered by the annex. The annex also specifies the principles used for assignment, the criteria for assignment (against which applications for assignment of a global terrestrial trunk radio access mobile network codes will be assessed), the process for considering the application, and the circumstances under which a terrestrial trunk radio access mobile network code would be reclaimed.
- Recommendation ITU-T E.475 "Guidelines for Intelligent Network Analytics and Diagnostics" specifies guidelines for intelligent network analytics and diagnostics for managing and troubleshooting networks. The Intelligent Network Analytics and Diagnostics (INAD) function is responsible for aggregating network data and setting up automatic tasks for network maintenance, providing the assurance of appropriate network performance, locating the service degradation area and service channels with poor performance, finding root causes of the detected network faults, probing network status, and predicting the possible network performance degradation at an early stage. Specifically, this Recommendation describes the design considerations, functional architecture, network anomaly analysis models for network analytics and

diagnostics. The network anomaly analysis model can be used to assess network anomaly degree, network performance, risk degree, to analyze the location and time of the network impairment and further to determine the root causes of the network impairments and to allow increased network visibility and network fault management automation. This Recommendation also presents the concept of Network Health Indicator (NHI) which provides a numerical indication of the network anomaly degree based on Big Data Analytics. The NHI is not focused on specific multimedia application rating (e.g., rating of specific audio application, video conferencing application) and application layer monitoring. Instead, it aims at network monitoring and evaluation of specific networks (e.g., LAN, WAN, Storage Network, Data Centre Network) and further triggers Network Diagnosis using Big Data based fault diagnosis algorithms and determine the root causes of the network anomaly events.

- **Recommendation ITU-T E.804.1 "Application guide for Recommendation ITU-T E.804: Quality of service aspects for popular services in mobile networks"** provides detailed guidance on the application of QoS metrics defined in Recommendation ITU-T E.804 section 7.
- **Recommendation ITU-T E.805 "Strategies to establish quality regulatory frameworks"** provides guidance to regulators aiming to establish national or regional regulatory frameworks to monitor and measure quality of service (QoS) and quality of experience (QoE).
- **Recommendation ITU-T E.812 "Crowdsourcing approach for the assessment of end-to-end QoS in fixed and mobile broadband networks"**: End-user equipment, consumer premise equipment and its software have evolved to become faster, more powerful and able to perform data collection. This has enabled the crowdsourcing approach which seeks to increase the amount of technical parameters which can be collected from end-users without modification to existing hardware and software. Increasingly, players such as regulators and service providers have started to assess end-to-end QoS through a crowdsourcing approach. However, assessment using data collected through the crowdsourcing approach can be deployed in multiple ways and different approach provides different view of QoS. This Recommendation outlines the different crowdsourcing approaches used to assess end-to-end QoS on both fixed and mobile broadband networks.
- **Recommendation ITU-T E.812 Amd.1 "Crowdsourcing approach for the assessment of end-to-end quality of service in fixed and mobile broadband networks - Amendment 1: New Appendix II and Appendix III"** introduces Appendix II (Use cases for the crowdsourcing approach) and Appendix III (Practical approaches to fixed broadband crowdsourcing).
- **Recommendation ITU-T F.735.1 "Requirements for software defined camera"**: With the development of hardware and intelligent algorithms, various intelligent algorithms are developed for massive scenarios. In order to meet the various scenarios and requirements, cameras supporting algorithms on-demand deployment and online upgrade without service interruption are needed. Software-defined camera is a kind of IPU (see [ITU-T F.743.1]), which provides a technical approach to decouple hardware and software and to support algorithms on-demand deployment, online upgrade without services interrupting, continuous online learning to adapt to

various scenarios. This Recommendation defines the typical scenarios, functional architecture and requirements of such software- defined camera.

- **Recommendation ITU-T F.740.1 "Requirements for an information service of objects in museums"** describes the requirements for an information service of objects in museums (ISOM) and the capabilities of key components of this information service. This information service can improve museum users' experience by collecting information about the exhibits and other related information from different parties and showing all the information in appropriate ways.
- **Recommendation ITU-T F.743 (revised, V2) "Requirements and service description for video surveillance"** defines a video surveillance service based on IP networks. The video surveillance service provides the display and storage of the video captured by multiple remote cameras over an IP network for multiple users. It also provides other functionalities such as remote control and alarming. This Recommendation provides the service description, a brief system model, service scenarios and requirements for the video surveillance service. The requirements for the video surveillance service are derived from the scenarios of different applications that a video surveillance service can support. Therefore, the service requirements meet the needs of different kinds of users and enable interoperability among video surveillance systems of different telecom operators and units of different vendors. This revision updates the title of this Recommendation, some technical content descriptions, and video surveillance system requirements in clause 8.
- **Recommendation ITU-T F.743.10 "Requirements for mobile edge computing enabled content delivery networks"** specifies the general framework, scenarios and requirements of the mobile edge computing (MEC) enabled content delivery network (CDN). It is also specified the requirements of the MEC functions on which the CDN edge node is relied. The deployment of CDN edge node with MEC system is described in the general framework. Several user cases are introduced in this Recommendation to illustrate the usage of the MEC enabled CDN. This Recommendation provides a new solution to enhance the current CDN service by adopting the MEC technology. MEC enabled CDN, consisting of conventional CDN and mobile edge CDN, is an effective way to reduce latency to improve user experience and save bandwidth for backbone network. In addition, deployment and maintenance costs are reduced.
- **Recommendation ITU-T F.743.11 "Requirements for video surveillance with mobile premises units"** defines requirements for video surveillance with mobile premises units. Mobile premises units can effectively enhance the flexibility of surveillance perspectives, expand surveillance scenarios and the application scope of video surveillance technology. Meanwhile, since the current wireless communication technology can support the mobile wireless transmission of video or image data, the application of wireless communication technology to mobile premises units can greatly improve the flexibility of video surveillance and construct a comprehensive video surveillance system. This Recommendation describes the application scenarios and the requirements for video surveillance with mobile premises units.
- **Recommendation ITU-T F.743.20 "Assessment framework for big data infrastructure"** gives an assessment framework of big data infrastructure, which includes functional

metrics, performance metrics, scalability metrics, security metrics, operation metrics and compatibility metrics.

- **Recommendation ITU-T F.743.21 "Framework for data asset management"** defines data asset management framework with its corresponding objects, activities and supports. Objects of data asset management are data assets, which include master data, metadata and other data assets. Activities include data standards management, data model management, data quality management, data security management, data valuation management, and data sharing management. In order to ensure the management, the corresponding people in charge, rules and regulations, and technology tools are needed.
- **Recommendation ITU-T F.746.10 "Architecture for spontaneous dialog processing system for language learning"** defines the architecture, functional entities, and interfaces for a spontaneous dialog processing system for language learning service which is described in [ITU-T F.746.5]. The scope of this Recommendation is focused on describing the architecture with different functional components in spontaneous dialog processing system, which are: input/output management, dialog understanding, dual dialog management and generation, dialog knowledge management, incremental dialog knowledge learning, unstructured spontaneous speech recognition management and language learning function. This Recommendation together with the existing standards "Framework for language learning system based on speech and natural language processing (NLP) technology" [ITU-T F.746.5] will support the future systems which are expected to be equipped with dialog processing and language learning functions for advanced user experiences.
- **Recommendation ITU-T F.746.11 "Interfaces for intelligent question answering system"** defines interfaces for Intelligent Question Answering Service. This recommendation defines the interfaces among functional modules to support intelligent Question Answering service described in [ITU-T F.746.3]. The scope of this Recommendation is focused on describing the interfaces among different functional components in intelligent question answering (QA) system: natural language processing function, question analysis function, candidate answer generation function, and answer inference/generation function. This Recommendation together with the existing standards "Intelligent Question Answering Service Framework" [ITU-T F.746.3] and "Metadata for Intelligent Question Answering Service" [ITU-T F.746.7] will support the future systems which are expected to be equipped with QA functions for advanced user experiences.
- **Recommendation ITU-T F.748.11 "Metrics and evaluation methods for deep neural network processor benchmark"** provides the benchmarking framework, evaluation metrics and methods, and the application scenarios for deep neural network processors while doing training and inference task. This can be used to guide relevant parties to test, select or evaluate the deep neural network processor under the specified application scenarios. The establishment of relevant application performance evaluation benchmarks can objectively reflect the current state of the AI processor by providing objective metrics and comparison dimensions.
- **Recommendation ITU-T F.749.3 "Use cases and requirements for the vehicular multimedia networks"**: The vehicular multimedia networks (VMN) consist of the

vehicular multimedia service platform (VMSP), broadcast and communication networks, and the vehicular multimedia system (VMS) in the vehicle. This Recommendation specifies use cases and requirements for the VMN, including overview, connectivity, intelligent human machine interfaces (HMI) for the VMS, privacy considerations, content rights protection in a converged network environment, copyright and rights management support for content delivery, security, safety, and definition of vehicular multimedia configurations. A series of Recommendations for vehicular multimedia networks is under the responsibility of ITU- T SG16. This Recommendation is a part of that series and gives the requirements and user cases for the VMN.

- **Recommendation ITU-T F.749.11 "Requirements of civilian unmanned aerial vehicles enabled mobile edge computing":** Civilian unmanned aerial vehicles (CUAV) enabled mobile edge computing (MEC) utilizes CUAV as mobile edge computing platform to realize a flexible, efficient and on-demand computing service which can be rapidly deployed and move according to the practical service needs of devices. This Recommendation describes the framework and specifies the requirements of CUAV-MEC system, including functional requirements, service requirements and security requirements. This Recommendation also provides a comprehensive framework of the MEC service through CUAV. CUAV-MEC can provide fast, dynamic, effective edge service for devices in hotspot and disaster scenarios, etc. Benefitting from the characteristics of flexible accessibility and on-demand services, CUAV-MEC can reduce the computation delay and improve service quality.
- **Recommendation ITU-T F.749.12 "Framework for communication application of civilian unmanned aerial vehicle"**: The civilian unmanned aerial vehicles are widely used in industry and consumer areas such as agriculture and plant protection, power line and petroleum pipeline inspection, police & traffic security surveillance, disaster monitoring, aerial photography & videography, express delivery, forestry and forest fire monitoring, meteorological, resource and scientific research etc. This Recommendation presents the general framework for communication application of CUAV and its functional entities, reference points, etc.
- **Recommendation ITU-T F.751.0 "Requirements for distributed ledger systems"** defines the requirements of distributed ledger systems. The distributed ledger system ensures the security of the data in the ledger and prevents malicious tampering. This makes distributed ledger systems potentially applicable to medical records and other record management activities, such as identity management, transaction processing, document sources, food traceability and voting. The scope of this Recommendation focuses on the basic and advanced requirements of the distributed ledger systems.
- **Recommendation ITU-T F.751.1 "Assessment criteria for distributed ledger technology (DLT) platforms"** defines assessment criteria for DLT platforms aim to assist implementers to evaluate and compare different platforms. Those 27 criteria covered the core functions, application functions, operation functions, and ecosystem of DLT platform. This Recommendation also defines the performance of DLT platform affected by environment and deployment reasons.
- **Recommendation ITU-T F.751.2 "Reference framework for distributed ledger technologies"** defines the reference architecture for distributed ledger technology

(DLT), the hierarchical relationship and specific functions of the DLT architecture, important modules and specific functions in the structure of DLT, the main technical route and direction of the core module in the DLT. It can be used as a guideline for DLT service providers to build system, and for the organizations to select and use a DLT platform.

- **Recommendation ITU-T G.650.1 (revised) "Definitions and test methods for linear, deterministic attributes of single-mode fibre and cable"** contains definitions of the linear, deterministic parameters of single mode optical fibres and cables. It also contains both reference test methods and alternative test methods for characterizing these parameters. These test methods are suitable mainly for factory measurements of the linear, deterministic attributes of single-mode fibres and cables. Some of the test methods may also be used to characterize discrete optical components.

  The fifth version of Recommendation ITU-T G.650.1 revised third alternative test method "Spectral attenuation modelling" (clause 6.4.4) to cover the applicability of fewer predictor wavelengths for the modelling of much narrower wavelength range. In Appendix III "Example of a matrix model", existing example matrix for G.652 fibre was replaced with new matrix using four predictor wavelengths, and added a new matrix for G.654.E fibre using three predictor wavelengths. Wavelength dependence of modelling error as a function of the number of predictor wavelengths was explained.

- **Recommendation ITU-T G.654 (revised) "Characteristics of a cut-off shifted single-mode optical fibre and cable"** describes the geometrical, mechanical and transmission attributes of a single-mode optical fibre and cable which has the zero-dispersion wavelength around 1 300 nm wavelength, and which is loss-minimized and cut-off wavelength shifted at around the 1 550 nm wavelength region. This is the latest revision of this Recommendation that was first created in 1988. In this version the attenuation coefficient of G.654.E to specify a wavelength dependency for estimating optical system design has been changed. Also, in this version a note has been added for cable cut-off wavelength when G.654.E fibre is used at central frequencies for applications specified in Recommendation G.698.2.

- **Recommendation ITU-T G.672 (revised) "Characteristics of multi-degree reconfigurable optical add/drop multiplexers"** provides a description of the relevant characteristics of multi-degree reconfigurable optical add/drop multiplexer (MD-ROADM) network elements. The MD-ROADM is intended to be used in optical networks based on dense wavelength division multiplexing (DWDM), to enhance network scalability and to support enhanced service provisioning and resilience features. This Recommendation also provides classification criteria and a list of optical transfer parameters for MD-ROADMs appropriate for both fixed and flexible DWDM grid applications. In this version of this Recommendation, additional optical transfer parameters have been specified.

- **Recommendation ITU-T G.694.1 (revised) "Spectral grids for WDM applications: DWDM frequency grid"** provides a frequency grid for dense wavelength division multiplexing (DWDM) applications. The frequency grid, anchored to 193.1 THz, supports a variety of channel spacings ranging from 12.5 GHz to 100 GHz and wider.

Edition 3.0 of this Recommendation also includes a flexible DWDM grid and definitions for "frequency slot" and "slot width" that can be applied also in fixed grid applications.

- **Recommendation ITU-T G.709/Y.1331 (revised) "Interfaces for the optical transport network (OTN)"** defines the requirements for the optical transport network (OTN) interface signals of the optical transport network, in terms of:
  - OTN hierarchy
  - functionality of the overhead in support of multi-wavelength optical networks
  - frame structures
  - bit rates
  - formats for mapping client signals.

  Edition 6.0 of this Recommendation includes the text of Amendments 1, 2, 3, Corrigendum 1 and 2 to Edition 5.0 of this Recommendation, addition of 25 and 50 Gbit/s OTU, ODU and OPU frame formats and multiplexing of lower rate ODUk/flex signals into these two OPUs, extension of the supported ODUflex(IMP) bit rates to any rate, specification of frequency synchronous OTU and ODU and addition of a new appendix with examples of ODUflex(GFP) and ODUflex(IMP) clock generation methods. Edition 6.0 furthermore clarifies that the ODUflex(GFP) bit rate can be any rate and is not limited to the recommended bit rates, updates the OTN interface terminology, corrects the replacement signal definitions for some of the Ethernet client signals and restricts the FlexE aware sub-rate granularity to 25 Gbit/s.

- **Recommendation ITU-T G.709/Y.1331 Amd.1 (revised) "Interfaces for the optical transport network (OTN) - Amendment 1" (under approval)** defines the requirements for the optical transport network (OTN) interface signals of the optical transport network, in terms of:
  - OTN hierarchy
  - functionality of the overhead in support of multi-wavelength optical networks
  - frame structures
  - bit rates
  - formats for mapping client signals.

  Edition 6.1 of this Recommendation includes the addition of tables with GCC bit rates, enhancements to the description of OTUCn-M behaviour, addition of an appendix that describes the implications on fault management for the case that the OTSiG (de)modulator process and associated OTSiG-O|OCh-O_TT function are located in adjacent equipment, and several typographical/editorial corrections.

- **Recommendation ITU-T G.709.1/Y.1331.1 (2018) Amd.2 "Flexible OTN short-reach interfaces - Amendment 2" (under approval)** restructures the definition of a FlexO-x frame and its overhead, adds payload type and reserved client specific overhead. In additional, FlexOsec encryption OH and functions are added.

- **Recommendation ITU-T G.709.3/Y.1331.3 (revied) "Flexible OTN long-reach interfaces" (under approval)** defines the flexible optical transport network (OTN),

known as FlexO, long-reach interfaces that support bonding (i.e. grouping) of multiple of these interfaces such that one or more client signals (e.g. one or more OTUCn (n ≥ 1)) can be transferred via one or more optical tributary signals (OTSi) over one or more physical interfaces. The Recommendation specifies the frame structure for FlexO long reach interfaces using forward error correction codes with a higher coding gain than used in the FlexO short reach interfaces that are specified in Recommendation ITU-T G.709.1/Y.1331.1 and multiplexing of OTUCn client signals into the payload of a FlexO group.

Edition 2 contains the following extensions to Edition 1.1:

– Addition of 100G, 200G and 400G FlexO with OFEC (16, Annexes D, E, G, appendices III, IV, V, bibliography)

– Addition of 100G FlexO with concatenated FEC (15.4.1, 15.5.4)

– Addition of multiplexing of OTUCn client signals into the payload of a FlexO group (Annex F).

- **Recommendation ITU-T G.709.4 "OTU 25 and OTU 50G short reach interfaces"** specifies an interface for an OTU25 and OTU50 short-reach interconnect application.
- **Recommendation ITU-T G.781 (revised) "Synchronization layer functions for frequency synchronization based on the physical layer"** defines the atomic functions that are part of the two synchronization layers, the synchronization distribution (SD) layer and the network synchronization (NS) layer. It also defines some atomic functions, part of the transport layer, which are related to synchronization. These functions describe the synchronization of SDH, Ethernet, and OTN NEs and how these NEs are involved in network synchronization. The specifications in this Recommendation are the superset of functionality of three regional standards bodies. Care should be taken when selecting from this Recommendation. Not every atomic function defined in this Recommendation is required for every application. Different subsets of atomic functions may be assembled in different ways according to the combination rules given in Recommendations ITU-T G.783, ITU-T G.705, ITU-T G.8021, ITU-T G.8121, and ITU T G.798 to provide a variety of different capabilities. Network operators and equipment suppliers may choose which functions must be implemented for each application.
- **Recommendation ITU-T G.798 Amd.3 "Characteristics of optical transport network hierarchy equipment functional blocks - Amendment 3" (under approval)** contains text modifications and additions for:

  – supporting 25 Gb/s and 50 Gb/s OTN interfaces.

  – supporting 200 Gb/s and 400 Gb/s FlexO interfaces.

  – supporting the adaptation of ODUkP to Ethernet Coding sublayer for 50 Gb/s Ethernet signals.

  – supporting the adaptation of ODUkP to SDI/1.5G SDI signals.

  – alignment with ITU-T G.709.1 and ITU-T G.709.3.
- **Recommendation ITU-T G.807 Amd.1 "Generic functional architecture of the optical media network - Amendment 1" (under approval)** describes the generic functional

architecture of the optical media network that supports the propagation of signals in the context of a transport network. This description is independent of the client CI that is being carried by a signal in the media network.

- **Recommendation ITU-T G.872 Amd.1 "Architecture of the optical transport network - Amendment 1" (under approval)** describes the functional architecture of the optical transport network (OTN) using the modelling methodology described in Recommendations ITU T G.800, ITU T G.805 and ITU T G.807. The OTN functionality is described from a network level viewpoint, taking into account, the characteristic information of clients of OTN, client/server layer associations, networking topology, layer network functionality and optical media network structure, which provide multiplexing, routing and supervision of digital clients. The digital layers of the OTN use the frame formats defined in ITU T G.709. The media portion of the network is described in terms of media constructs, media elements and optical signal maintenance entities.
- Recommendation ITU-T G.874 (revised) "Management aspects of optical transport network elements" addresses management aspects of optical transport network (OTN) elements containing transport functions of one or more of the layer networks of the OTN. The management of the optical layer networks is separable from that of its client layer networks so that the same means of management can be used regardless of the client. The management functions for fault management, configuration management and performance monitoring are specified. Recommendation ITU-T G.874 (2020) aligns with the updates in ITU-T G.709 and ITU-T G.798, and harmonizes with ITU-T G.7710 clauses 8 and 10 on the generic requirements.
- Recommendation ITU-T G.971 (revised) "General features of optical submarine cable systems" applies to optical fibre submarine cable systems. The purpose of this Recommendation is to identify the main features of optical fibre submarine cable systems, and to provide generic information on relevant Recommendations in the field of optical fibre submarine cable systems. A common implementation relevant to all the optical fibre submarine cable systems is described in Annex A. Specific information relevant to each optical fibre submarine cable systems is included in annexes of other Recommendations. The updated data on cable ships and submersible equipment of various countries are also described in Appendix I. In this latest version, the diagram of interoperable optical fibre submarine cable systems and boundaries are described in Fig.1 (b).
- Recommendation ITU-T G.972 (revised) "Definition of terms relevant to optical fibre submarine cable systems" applies to optical fibre submarine cable systems. The purpose of this Recommendation is to provide definitions of terms relevant to optical fibre submarine cable systems, including terms relevant to system configuration, system aspects, terminal equipment, optical submarine repeaters and branching units, optical fibre submarine cable, manufacturing and installation, and the maintenance of the submarine portion. Appendix I is the alphabetical list of terms defined in this Recommendation.
- **Recommendation ITU-T G.977.1 "Transverse compatible DWDM applications for repeatered optical fibre submarine cable systems" (under approval)** provides

physical layer specifications for dense wavelength division multiplexing (DWDM) applications on dispersion-unmanaged repeatered optical fibre submarine cable systems. Transverse compatible applications for DWDM applications for repeatered optical fibre submarine cable systems are described for point-to-point, multichannel line systems with optically pumped amplifiers. The primary purpose is to enable multiple vendors to design DWDM transmission equipment for submarine fibre links that are compliant with this Recommendation.

- **Recommendation ITU-T G.798 (2017) Amd.2 "Characteristics of optical transport network hierarchy equipment functional blocks - Amendment 2"** specifies both the components and the methodology that should be used in order to specify the optical transport network (OTN) functionality of network elements; it does not specify individual optical transport network equipment. Amendment 2 contains text modifications and additions for:
  - OTSi to OTU4 adaptation function with SC-FEC.
  - OTSi to FlexO-1-SC adaptation function.
  - alignment with ITU-T G.709.1.
- **Recommendation ITU-T G.807 "Generic functional architecture of the optical media network"** describes the generic functional architecture of the optical media network that supports the propagation of signals in the context of a transport network. This description is independent of the client digital information that is being carried by a signal in the media network.
- **Recommendation ITU-T G.875 (revised) "Optical transport network: Protocol-neutral management information model for the network element view"** provides a protocol-neutral management information model for managing network elements in the optical transport network (OTN). The model contains the managed entities and their properties that are useful to describe the information exchanged across interfaces defined in the ITU-T M.3010 telecommunications management network (TMN) architecture. The protocol-neutral management information model shall be used as the base for defining protocol-specific management information models, for example, common management information service element (CMISE), common object request broker architecture (CORBA) and simple network management protocol (SNMP) information models. Mapping from the protocol-neutral entities into protocol-specific objects is a decision of the specific protocol modelling design and should be described in the protocol-specific information model Recommendations. The 2020 revision of this Recommendation up-versions the UML model tool to Papyrus v4.1.0 and the profile to v0.2.17; updates and cleans up the model for ODU, adding support for ODUCn, ODU Delay Measurement, GCC1/2 management, ODU clients (aligning with G.709 v6), OTU and FlexO; add the model for GFP management; deprecates duplicated attributes and associations; un-deprecates the OTU CTP object classes and fixes some other errors.
- **Recommendation ITU-T G.872 (revised) "Architecture of optical transport networks (OTN)"** describes the functional architecture of the optical transport network (OTN) using the modelling methodology described in Recommendations ITU-T G.800, ITU-T G.805 and ITU-T G.807. The OTN functionality is described from a network level

viewpoint, taking into account, the characteristic information of clients of OTN, client/server layer associations, networking topology, layer network functionality and optical media network structure, that provide multiplexing, routing and supervision of digital clients. The media portion of the network is described in terms of media constructs, media elements and optical signal maintenance entities.

- **Recommendation ITU-T G.984.3 (2014) Amd.1 "Gigabit-capable passive optical networks (G-PON): Transmission convergence layer specification"** describes the transmission convergence layer for gigabit-capable passive optical networks – a family of flexible access networks capable of providing a range of broadband and narrow-band services, operating at the rates of 2.48832 Gbit/s downstream and 1.24416 or 2.48832 Gbit/s upstream. This Recommendation includes the specifications of the following:
  - gigabit PON transmission convergence (GTC) layer framing;
  - upstream time division multiple access mechanism;
  - physical layer operation, administration and maintenance (OAM) messaging channel;
  - principles and signalling mechanism of the upstream dynamic bandwidth assignment;
  - optical network unit (ONU) activation method;
  - forward error correction;
  - security.

  This Recommendation forms an integral part of the G.984-series of ITU-T Recommendations that, together, specify a single coherent set of access transmission systems. The present Amendment provides necessary extensions to support Class D ODN.
- **Recommendation ITU-T G.984.5 (2014) Amd.2 (revised) "Gigabit-capable passive optical networks (G-PON): Enhancement band - Amendment 2"** defines wavelength ranges reserved for additional service signals to be overlaid via wavelength division multiplexing (WDM) in future passive optical networks (PON) for maximizing the value of optical distribution networks (ODNs). This amendment 2 includes Updates of general reference diagram of coexistence element, Isolation and Directivity requirements for GPON and XG(S)-PON pairing of a generic 2-port coexistence CEx, Updates of methods for calculating required isolation for WDM/CE/CEM devices, filter considerations for HSP and XG(S)-PON OLT, and optical interface parameters for GPON/XG(S)-PON MPM supporting Class D OPL.
- **Recommendation ITU-T G.987.2 (2016) Amd.2 "10-Gigabit-capable passive optical networks (XG-PON): Physical media dependent (PMD) layer specification - Amendment 2"** continues the maintenance and evolution of physical media dependent (PMD) layer specifications for XG-PON as defined in this Recommendation. It includes technical updates and corrections for changing references to XG-PON1 to XG-PON, replacing the mask of the eye diagram for ONU transmitter, updating the DD40 downstream specification, correcting the X/S tolerance mask for ONU and updating the X/S tolerance mask for OLT.

- **Recommendation ITU-T G.987.3 (2014) Amd.1 "10-Gigabit-capable passive optical networks (XG-PON): Transmission convergence (TC) layer specification - Amendment 1"** describes the transmission convergence layer for 10 gigabit capable passive optical network systems – a family of flexible access network systems that operate over a point-to-multipoint optical access infrastructure at nominal data rates in the order of 10.0 Gbit/s in at least one direction, while providing a wide range of broadband and narrow-band services to end-users. The present Amendment extends to the G.987.3 the concept of Cooperative DBA and the general DBA framework, which have been developed in the context of G.989.3, and extends the maximum number of the burst allocation series per ONU in a BWmap to 16.
- **Recommendaion ITU-T G.988 (2017) Amd.3 "ONU management and control interface (OMCI) specification: Amendment 3"** adds:
  - Support for the discovery of Extended VLAN tagging operation configuration data ME enhanced mode through the ONU3-G ME.
  - Support for Extended VLAN ME tagging operation configuration data ME enhanced mode.
  - Corrections to Table 9.1.5-1 "Plug-in unit types".
- **Recommendation ITU-T G.989.2 Amd.1 "40-Gigabit-capable passive optical networks 2 (NG-PON2): Physical media dependent (PMD) layer specification - Amendment 1" (under approval)** updates the Annex D on power spectral density (PSD) values, to reflect the more recent changes in the PMD spec.
- **Recommendation ITU-T G.989.3 (2015) Amd.3 "40-Gigabit-capable passive optical networks (NG-PON2): Transmission convergence layer specification - Amendment 3"** clarifies the use of SeqNo in the upstream PLOAM messages, clarifies the distinction between Performance Monitoring counters and other Performance Monitoring parameters, and provides regular specification maintenance.
- **Recommendation ITU-T G.994.1 Amd.1 "Handshake procedures for digital subscriber line transceivers - Amendment 1"** includes the following new technical material:
  - codepoints for support of ITU-T G.9701 extended range of $T_{g1'}$.
- **Recommendation ITU-T G.994.1 Amd.2 "Handshake procedures for digital subscriber line transceivers - Amendment 2" (under publication)** fully integrates the Amendment 1 to Recommendation ITU-T G.994.1 (2018) and includes the following new technical material:
  - A new annex with a collision control protocol for point-to-multipoint operation
  - Modify the mandatory carrier set for G.9701 Annex X with operation over coax
  - A new annex M with managed objects in a new format compatible with a YANG model
  - Add codepoints for the support of G.9711.

- **Recommendation ITU-T G.997.2 Amd.1 "Physical layer management for G.fast transceivers - Amendment 1"** integrates the Corrigendum 1 to ITU-T Rec G.997.2 (2019) and includes in addition:
  - Add managed objects for the support of RMC sub-carrier masking
  - Add managed objects for the support of TGVN
  - Add managed objects for the support of PREFNDR.
- **Recommendation ITU-T G.997.2 Amd.2 "Physical layer management for G.fast transceivers - Amendment 2"** integrates the Amendment 1 of ITU-T Rec. G.997.2 and includes the following new material:
  - Extend the range of minimal Mds with cDTA to 5

  In addition, it corrects the following items:
  - Aligned the valid ranges of frequencies of MIBPSDMASK with G.9701.
  - Explicit the "empty array" in the valid values of configuration parameters.
  - Explicit the constraint of G.9701 on the configuration of RMCR_LOR_TRIGGER and LOR_PERSISTENCY.
  - Correct the frequency range of one IAR
  - Update the reference RFC6020 to RFC7950
  - Update the reference RFC7223 to RFC8343
  - Incorrect references to G.9701.

  The changes relative to corrected items are with the following change bars.

  The changes relative to new material are with the following change bars.
- **Recommendation ITU-T G.997.3 "Physical layer management for MGfast transceivers" (under approval)** specifies the physical layer management for Multi-gigabit fast access to subscriber terminals (MGfast) transmission systems. It specifies managed objects for configuration, fault, status, inventory and performance management.
- **Recommendation ITU-T G.1033 "QoS and QoE aspects of digital financial services"** highlights important aspects related to Quality of Service (QoS) and Quality of Experience (QoE) which shall be considered in the context of Digital Financial Services (DFS). It builds upon the discussions in the (now closed) ITU-T Focus Group Digital Financial Services. The continuation of work on QoS and QoE aspects is undertaken by the Financial Inclusion Global Initiative (FIGI).
- **Recommendation ITU-T G.1034 "QoE metrics for mobile telephony communication during rail travel"** presents a novel high-level end-to-end KPI for telephony intended to be used in rail and street-bound public transport scenarios where movement is a constituting factor. The methodologies and metrics described in this Recommendation will allow to generate a holistic view of the end-user experience and solid predictions for a wide range of use case parameters based on measurement data, while at the same reducing resources and efforts needed to collect this measurement data. It will extend the existing range of QoS metrics by leveraging the particular

properties of public transport scenarios that are defined by repeatability and reproducibility. While the described methodology focuses on telephony, it is easily possible to extend it to cover other types of service tests. This Recommendation will benefit all stakeholders in public transport: rail passengers who will encounter a high QoE, railway operators who will be enabled to provide competitive and attractive services and last but least the network operators, who will be able to optimize their efforts and resources.

- Recommendation ITU-T G.1035 "Influencing factors on quality of experience (QoE) for virtual reality (VR) services" classifies virtual reality services and identifies the key QoE factors of VR.

- Recommendation ITU-T G.1072 "Opinion Model Predicting Gaming QoE for Cloud Gaming Services" presents an opinion model that predicts the overall gaming Quality of Experience (QoE) of non-expert gamers for cloud gaming services. The model uses an impairment factor approach in which the impact of typical IP network parameters and video encoding parameters on the video and input quality is estimated. The knowledge summarized in ITU-T G.1032 and ITU-T P.809 serves as a basis for the development of the model. The model is a network planning tool which can be used by stakeholders to manage resource allocation and to configure IP-network transmission settings such as the selection of encoding framerates, resolutions, and bitrates, under the assumption that the network is prone to packet loss and latency. Depending on whether the respective stakeholder has a priori knowledge of the type of game being offered through the cloud gaming service, either a default mode, which assumes the game to be highly sensitive towards delays and frame losses as well as highly encoding complex, or an extended mode, which uses adjusted model coeffiecient to increase the prediction accuracy, can be used.

- **Recommendation ITU-T G.7701 Amd.2 "Common control aspects - Amendment 2" (under approval)** describes concepts that are common to both software defined networking (SDN) controller and automatically switched optical network (ASON) control approaches, including common aspects of the interaction between the control functions, management functions and transport resources.

- Recommendation ITU-T G.7710/Y.1701 (revised) "Common equipment management function requirements" addresses the equipment management functions (EMFs) inside a transport network element that are common to multiple technologies. For example, common applications are described for date and time, fault management, configuration management, account management, performance management and security management. These applications result in the specification of common EMF functions and their requirements. The 2020 revision of this Recommendation has incorporated the following major updates

  - Update Clauses 6 and 7 to harmonize with G.874, G.8051, and G.8151
  - Replace the term EMS with MCS
  - Update Figure 3 to use ODUk and packet-based connections for inter-site communications additionally
  - Update Figure 4 for hybrid NE of management network that supports both a media layer and digital layers

- Update Figures 7 and 62 for replacing cZZZ-value with MI_cZZZ
- Update Figure 22 and Clause 8.8 for replacing XXX_Reported with ZZZ_Reported to align with G.806.

❖ **Recommendation ITU-T G.7718 (revised) "Framework for the management of MC components and functions"** contains the framework for ASON management. It places ASON management within the TMN context and specifies how the TMN principles may be applied. A management view of the ASON control plane is developed. This view provides the bases for the ASON management requirements specified in this Recommendation. Identifier spaces needed in ASON management are specified. Examples of management system structures and ASON related management applications are contained in the appendices. The 2020 Edition of the Recommendation extends the scope from ASON management to management of MC (management and control) components and functions.

❖ **ITU-T G.8001 Imp (revised) "Implementers' guide for Recommendation ITU-T G.8001/Y.1354 (2020)"** is an Implementers' Guide for Recommendation ITU-T G.8001/Y.1354 (2016-04). This version contains all updates submitted up to and including those at Study Group 15 meeting in January/February 2020.

❖ **Recommendation ITU-T G.8011/Y.1307 (revised) "Ethernet service characteristics"** describes a framework for defining network-oriented characteristics of Ethernet services based on MEF Forum (MEF) specifications. The framework is supported by the modelling of Ethernet layer networks described by ITU-T and MEF. The service definition, service attributes and operation, administration and maintenance (OAM) introduced in this framework are used to create numerous specific Ethernet services. This Recommendation supersedes Recommendation ITU-T G.8011/Y.1307.1 (2018).

❖ **Recommendation ITU-T G.8032/Y.1344 (revised) "Ethernet ring protection switching"** defines the automatic protection switching (APS) protocol and protection switching mechanisms for Ethernet layer network (ETH) ring topologies. Included are details pertaining to Ethernet ring protection characteristics, architectures and the ring APS (R-APS) protocol. This revision updates references, removes items formerly considered for further study and incorporates terms formerly defined in ITU-T Recommendation G.8001/Y.1354 (2016).

❖ **Recommendation ITU-T G.8051/Y.1345 (revised) "Management aspects of the Ethernet Transport (ET) capable network element"** addresses management aspects of the Ethernet transport (ET) capable network element containing transport functions of one or more of the layer networks of the Ethernet transport network. The management of the Ethernet layer networks is separable from that of its client layer networks so that the same means of management can be used regardless of the client. The management functions for fault management, configuration management, performance monitoring and security management are specified. The 2020 revision of this Recommendation has updated clause 6 to clause 8 by referring to Recommendation ITU T G.7710; the fault cause persistency function and the provisioning and reporting for adaptation functions for FlexE related functions as defined in Recommendation ITU T G.8023; transferring ODU related adaptation functions in some tables to Recommendation ITU T G.874.

- **Recommendation ITU-T G.8052.1/Y.1346.1 "Transport OAM Management Information/Data Models for Ethernet Transport Network Element" (under approval)** specifies the management information model and data models for Ethernet Transport Network Element (NE) to support specific interface protocols and specific Management Control (MC) functions. The information model is interface protocol neutral and specified using the Unified Modelling Language (UML). The information model of this Recommendation is derived through pruning and refactoring from the Recommendation [ITU-T G.7711/Y.1702] core information model and Recommendation [ITU-T G.8052/Y.1346] foundation Ethernet Transport NE information model. The data models are interface protocol specific and translated from the information model with the assistance of automated translation tooling. The specific data models considered in this Recommendation include, but not limited to, YANG data models. The specific MC functions covered by this Recommendation are the ITU-T defined Ethernet Operation, Administration, and Maintenance (OAM) functions, with the set of op codes assigned to the ITU-T and the corresponding OAM Protocol Data Units (PDU) and behaviours being specified in Recommendation [ITU-T G.8013/Y.1731] and the equipment characteristics in [ITU-T G.8021/Y.1341]. These OAM functions complement the IEEE 802.1 defined Connectivity Fault Management (CFM) functions; and the YANG module defined in this Recommendation augments the IEEE 802.1Q CFM YANG module.
- **Recommendation ITU-T G.8110.1 Amd.1 "Architecture of the Multi-Protocol Label Switching transport profile layer network - Amendment 1"** updates references, removes items formerly considered for further study and incorporates terms formerly defined in ITU-T Recommendations G.8101/Y.1355 (2016).
- **Recommendation ITU-T G.8112/Y.1371 (revised) "Interfaces for the MPLS transport profile layer network"** specifies the interfaces for the multi-protocol label switching transport profile (MPLS-TP) layer network. The interfaces for the MPLS-TP layer network use various server layer networks, like the plesiochronous digital hierarchy (PDH), synchronous digital hierarchy (SDH), optical transport hierarchy (OTH) and the Ethernet MAC layer network (ETH).
- **Recommendation ITU-T G.8151/Y.1374 (revised) "Management aspects of the MPLS-TP network element"** addresses management aspects of the multi-protocol label switching (MPLS) transport profile (MPLS-TP) capable network element containing transport functions of one or more of the layer networks of the MPLS-TP network. The management of the MPLS-TP layer networks is separable from that of its client layer networks so that the same means of management can be used regardless of the client. The management functions for fault management, configuration management, performance monitoring and security management are specified. This Recommendation aligns with the MPLS-TP architecture and requirements jointly developed by IETF and ITU-T and provides the specification for managing MPLS-TP network elements (NEs) that support the operations, administration, maintenance (OAM) protocol neutral equipment functionality as defined in Recommendations ITU T G.8121/Y.1381, G.8121.1/Y.1381.1 and G.8121.2/Y.1381.2.
- **Recommendation ITU-T G.8152.1/Y.1375.1 "AM Information/Data Models for MPLS-TP Network Element" (under approval)** specifies the OAM information model

and data models for MPLS-TP transport Network Element (NE) to support specific interface protocols and specific management and control functions. The information model is interface protocol neutral and derived from pruning and refactoring the G.7711/Y.1702 core information model and G.8152/Y.1375 foundation MPLS-TP NE information model.The data models are interface protocol specific and translated from the information model with the assistance of automated translation tool. The specific data models considered in this Recommendation include, but not limited to, YANG data models.The specific management and control functions covered by this Recommendation are the G.8113.1/Y.1372.1 specific OAM functions. The YANG modules of this Recommendation are aimed to be compatible with the relevant base generic YANG modules from the IETF for the G.8113.1/Y.1372.1 OAM functionality.

- **Recommenation ITU-T G.8152.2/Y.1375.2 "Resilience Information/Data Models for MPLS-TP Network Element" (under approval)** specifies the resilience management information model and data models for MPLS-TP Network Element (NE) as defined in [ITU-T G.8131] and [ITU-T G.8132]. The information model is interface protocol neutral and specified using the Unified Modelling Language (UML). The information model of this Recommendation is derived through pruning and refactoring from the Recommendation [ITU-T G.7711/Y.1702] core information model and Recommendation [ITU-T G.8152/Y.1375] foundation MPLS-TP NE information model. The data models are interface protocol specific and translated from the information model with the assistance of automated translation tooling. The specific data models considered in this Recommendation include, but not limited to, YANG data models.

- Recommendation ITU-T G.8260 (revised) "Definitions and terminology for synchronization in packet networks" provides the definitions, terminology and abbreviations used in ITU T Recommendations on timing and synchronization in packet networks.

- Recommendation ITU-T G.8261/Y.1361 (2019) Amd.1 "Timing and synchronization aspects in packet networks - Amendment 1" provides the following updates:
  - Addition of new TDEV mask to clause 9.2.1.4.

- Recommendation ITU-T G.8261/Y.1361 Amd.2 "Timing and synchronization aspects in packet networks - Amendment 2"**v** provides the following update:
  - Addition of new MTIE mask for short chains of clocks (clause 9.2.1.4.2).

- Recommendation ITU-T G.8262 (2018) Amd.1 "Timing characteristics of synchronous equipment slave clock - Amendment 1" provides the following updates:
  - Updates References
  - Adds a note in clause 9.2.1
  - Changes Figure 13 in Clause 11.2.1
  - Adds PAM4 interfaces in Appendix III
  - Adds a sentence in Appendix VII.

- Recommendation ITU-T G.8271 (revised) "Time and phase synchronization aspects of telecommunication networks" defines time and phase synchronization aspects in packet networks. It specifies the suitable methods to distribute the reference timing

signals that can be used to recover the phase synchronization and/or time synchronization according to the required quality. The requirements for the synchronization characteristics that are specified in this Recommendation must be adhered to in order to ensure interoperability of equipment produced by different manufacturers and a satisfactory network performance.

- **Recommendation ITU-T G.8271.1/Y.1366.1 (revised) "Network limits for time synchronization in packet networks with full timing support from the network"** specifies the maximum network limits of phase and time error that shall not be exceeded. It specifies the minimum equipment tolerance to phase and time error that shall be provided at the boundary of packet networks at phase and time synchronization interfaces. It also outlines the minimum requirements for the synchronization function of network elements. This Recommendation addresses the case of time and phase distribution across a network by a packet-based method with full timing support to the protocol level from the network.
- **Recommendation ITU-T G.8271.1/Y.1366.1 Amd.1 "Network limits for time synchronization in Packet networks with full timing support from the network - Amendment 1"** provides the following update:
  - Addition of new clause 7.5
  - New version of Figure II.6, and addition of text to Appendix II
  - Clarifications to Appendix V
  - Addition of clause XII.5 and XII.6.
- **Recommendation ITU-T G.8272 (2018) Amd.1 "Timing characteristics of primary reference time clocks - Amendment 1"** provides the following updates:
  - Modified the scope.
  - In clause 6, amend the final sentence (immediately before clause 6.1) to read (insertions highlighted):
  - In clause 6.2, new sentence is added.
  - Replace the second paragraph after Figure I.4 of clause I.3.1.
- **Recommendation ITU-T G.8273 (2018) Amd.1 "Framework of phase and time clocks - Amendment 1"** provides the following updates:
  - Updates References
  - Adds Appendix IV
  - Editorial changes in Annex B and minor edits throughout the document.
- **Recommendation ITU-T G.8273.2/Y.1368.2 Amd.1 (revised) "Timing characteristics of telecom boundary clocks and telecom time slave clocks for use with full timing support from the network - Amendment 1"** provides the following updates:
  - Updates the title of the recommendation
  - Updates References
  - Adds a Note in clause 7.1.1

- Adds a reference to [ITU-T G.8260] and a Note in clause 7.1.4
- Adds Noise tolerance for clock class C
- Makes editorial changes and updated Appendix V for T-BC chains
- Changes 1 PPS to 1PPS (without space) throughout the Recommendation.

❖ **Recommendation ITU-T G.8273.2/Y.1368.2 (revised) "Timing characteristics of telecom boundary clocks and telecom time slave clocks for use with full timing support from the network"** specifies minimum requirements for time and phase for telecom boundary clocks and telecom time slave clocks used in synchronization network equipment that operates in the network architecture as defined in Recommendations ITU-T G.8271, ITU-T G.8271.1, ITU-T G.8275 and ITU-T G.8275.1. It supports time and/or phase synchronization distribution for packet-based networks. This version of the Recommendation only applies to full timing support from the network. These requirements apply under the normal environmental conditions specified for the equipment.

❖ **Recommendation ITU-T G.8273.3/Y.1368.3 (revised) "Timing characteristics of telecom transparent clocks for use with full timing support from the network"** defines the minimum requirements for telecom transparent clocks (T-TCs). These requirements apply under normal environmental conditions specified for the equipment. This Recommendation includes: clock accuracy, noise generation, noise tolerance, noise transfer, and transient response for T-TCs.

❖ **Recommendation ITU-T G.8273.4/Y.1368.4 "Timing characteristics of telecom boundary clocks and telecom time slave clocks for use with partial timing support from the network"** specifies minimum requirements for time and phase synchronization equipment used in synchronization network that operates in the assisted partial timing support (APTS) and partial timing support (PTS) architectures.

❖ **Recommendation ITU-T G.8275/Y.1369 (revised) "Architecture and requirements for packet-based time and phase delivery"** provides the following updates:

- Common Annex and Appendix material to G.8275.1 and G.8275.2 added as Annex C, Annex D, and Appendix VIII.

❖ **Recommendation ITU-T G.8275.1/Y.1369.1 Amd.1 "Precision time protocol telecom profile for phase/time synchronization with full timing support from the network - Amendment 1" (under approval)** provides the following updates:

- Annex B, Annex E, and Appendix V, common to G.8275.1 and G.8275.2, moved to G.8275.
- Add Packet timing signal fail support.

❖ **Recommendation ITU-T G.8275.1/Y.1369.1 (revised) "Precision time protocol telecom profile for phase/time synchronization with full timing support from the network"** contains the ITU-T precision time protocol (PTP) profile for phase and time distribution with full timing support from the network. It provides the necessary details to utilize IEEE 1588 in a manner consistent with the architecture described in Recommendation ITU T G.8275/Y.1369.

- **Recommendation ITU-T G.8275.2/Y.1369.2 (revised) "Precision time protocol telecom profile for phase/time synchronization with partial timing support from the network"** contains the ITU-T precision time protocol (PTP) profile for phase/time distribution with partial timing support from the network (unicast mode). It provides the necessary details to utilize IEEE 1588 in a manner consistent with the architecture described in Recommendation ITU-T G.8275/Y.1369. This Recommendation defines the PTP profile for unicast mode only. Future editions of this Recommendation may contain a separate profile for a mixed unicast/multicast case.
- **Recommendation ITU-T G.8275.2/Y.1369.2 Amd.1 "Precision time protocol telecom profile for phase/time synchronization with partial timing support from the network - Amendment 1" (under approval)** provides the following updates:
  - Annex B, Annex E, and Appendix IV, common to G.8275.1 and G.8275.2, moved to G.8275.
  - Updated "for further study" references to refer to G.8273.4.
  - New material added to clause 6.7.11 Packet timing signal fail.
  - New members "portDS.syncReceiptTimeout" and "portDS.delayRespReceiptTimeout" added to Table A.5 portDS data set member specifications.
- **Recommendation ITU-T G.8310 "Functional architecture for metro transport network" (under approval)** describes the functional architecture of the metro transport network (MTN) using the modelling methodology described in [ITU T G.800], and [ITU T G.805]. MTN is primarily intended to support transport of D RAN and C RAN traffic. The MTN functionality is described from a network level viewpoint, taking into account the client characteristic information, client/server layer associations, networking topology, and layer network functionality that provide multiplexing, routing and supervision of the digital clients. MTN consists of two non recursive layers, the MTN Path layer, and the MTN Section layer. The MTN Path layer uses the MTN Section layer as its server layer. The MTN Path layer provides configurable connection-oriented connectivity. The server layer for the MTN section layer is provided by 50GBASE R, 100GBASE R, 200GBASE R, 400GBASE R Ethernet interfaces.
- **Recommendation ITU-T G.8312 "Interfaces for a metro transport network" (under approval)** describes a transport technology targeted for metro transport networks, including transport of distributed radio access network (D RAN) and centralized radio access network (C RAN) traffic. This technology leverages existing and emerging pluggable Ethernet modules and reuses FlexE implementation logic.
- **Recommendation ITU-T G.9701 (2019) Amd.1 "Fast access to subscriber terminals (G.fast) – Physical layer specification – Amendment 1"** includes enhancements to DTA functionality.
- **Recommendation ITU-T G.9701 (2019) Amd.2 "Fast access to subscriber terminals (G.fast) - Physical layer specification: Amendment 2"** includes a new Annex on targeted generalized vectoring with non-active G.9701 supporting lines (TGVN).

- **Recommendation ITU-T G.9701 (2020) Amd.3 "Fast access to subscriber terminals (G.fast) - Physical layer specification: Amendment 3" (under publication)** includes support to decrease the minimum value of Mds to 5 with cDTA.
- Recommendation ITU-T G.9710 "Multi-gigabit fast access to subscriber terminals (MGfast) – Power spectral density specification" specifies power spectral density (PSD) mask requirements for Multi-gigabit fast access to subscriber terminals (MGfast), a set of tools to support reduction of the transmit PSD mask, and a methodology for transmit PSD verification. It supports operation over both twisted pair and coaxial cable media.
- **Recommendation ITU-T G.9711 "Multi-gigabit fast access to subscriber terminals (MGfast) - Physical layer specification (New)" (under approval)** specifies a multi-gigabit broadband access technology that exploits the existing infrastructure of wire-pairs and coaxial cable that were originally deployed for plain old telephone service (POTS) or TV services. Equipment implementing this Recommendation can be deployed from fibre-fed distribution points (fibre to the distribution point, FTTdp) located very near the customer premises, or within buildings (fibre to the building, FTTB). This Recommendation supports asymmetric and symmetric transmission at an aggregate net data rate up to 10 Gbit/s on metallic wires using spectrum up to 424 MHz and specifies all necessary functionality to support far-end crosstalk (FEXT) cancellation between multiple wire-pairs.
- Recommendation ITU-T G.9804.1 "Higher Speed Passive Optical Networks: Requirements" serves as a guide to the development of higher speed PON systems, by identifying sets of applications that can be addressed by a particular system, and defining the requirements for each of those systems. It is anticipated that there may have several distinct systems, such as higher speed single channel (TDMA-PON), higher speed multi-channel (TWDM-PON), and higher speed point to point overlay PONs.
- Recommendation ITU-T G.9806 "Higher speed bidirectional, single fibre, point-to-point optical access system (HS-PtP)" describes a higher speed bidirectional single fibre point-to-point optical access system than the data rate in existing ITU-T point-to-point access systems. It supports 10 Gbit/s and above for the optical access services including the optical distribution network (ODN) specification, the physical layer specification, services requirements and the operation, administration and maintenance (OAM) specification.
- Recommendation ITU-T G.9806 Amd.1 "Higher speed bidirectional, single fibre, point-to-point optical access system (HS-PtP)- Amendment 1" describes a higher speed bidirectional single fibre point-to-point optical access system than the data rate in existing ITU-T point-to-point access systems. It supports 10 Gbit/s and 25 Gbit/s for the optical access services including the optical distribution network (ODN) specification, the physical layer specification, services requirements and the operation, administration and maintenance (OAM) specification.
- Recommendation ITU-T G.9807.1 (2016) Amd.2 "10-Gigabit-capable symmetric passive optical network (XGS-PON)" continues the maintenance and evolution of ITU-T G.9807 (2016), and provides additional details regarding 40km operation, E2 budget

class, OLT X/S tolerance mask definition, low latency traffic identification and other minor specification adjustments.

- **Recommendation ITU-T G.9960 (2018) Amd.1 "Unified high-speed wire-line based home networking transceivers - System architecture and physical layer specification: Amendment 1"** includes the extension of the Recommendation to operate on an extended bandwidth over coaxial and phoneline mediums, multi-level coding and RCM schemes.
- **Recommendation ITU-T G.9960 (2018) Amd.2 "Unified high-speed wire-line based home networking transceivers - System architecture and physical layer specification"** includes a new Annex R on the use of reverse power feeding techniques for G.hn over coaxial media, and adds a field to the PHY frame header of the MAP to better control PSD levels in complex networks such as those for Smart Grid applications.
- **Recommendation ITU-T G.9961 (2018) Amd.1 "Unified high-speed wireline-based home networking transceivers – Data link layer specification: Amendment 1"** includes a new physical layer specification. This new physical layer provides new modulation mechanisms (e.g. Multi Level Coding) and Robust Communication Mode (RCM) and allows the system to be operated over an extended bandwidth for coaxial and phoneline mediums.
- **Recommendation ITU-T G.9961 (2018) Amd.2 "Unified high-speed wireline-based home networking transceivers - Data link layer specification - Amendment 2"** includes a new Annex D on IEEE 802.1X port-based network access control, means for delivering management data across the A interface, and support for a wider range of applications of the G.hn technology (e.g., means to indicate the category of applications and actual application that the domain is implementing).
- **Recommendation ITU-T G.9961 (2015) Amd.3 "Unified high-speed wire-line based home networking transceivers - Data link layer specification: Amendment 3"(under publication)** includes enhancements to simplify routing mechanisms in tree topologies.
- **Recommendation ITU-T G.9962 Amd.1 "Unified high-speed wire-line based home networking transceivers - Management specification - Amendment 1"** includes a new logical interface between the Security Controller Entity and the Domain Master Management Entity.
- **Recommendation ITU-T G.9963 Amd.1 "Unified high-speed wireline-based home networking transceivers - Multiple input/multiple output specification: Amendment 1" (under publication)** aligns this Recommendation with recommendations [ITU-T G.9960], [ITU-T G.9961] and [ITU-T G.9962].
- **Recommendation ITU-T G.9964 (2011) Amd.3 "Unified high-speed wireline-based home networking transceivers – Power spectral density specification - Amendment 3"** includes the extension of the Recommendation to operate on an extended bandwidth over coaxial and phoneline mediums.
- **Recommendation ITU-T G.9991 (2019) Amd.1 "High-speed indoor visible light communication transceiver - System architecture, physical layer and data link layer**

specification (Amendment 1)" includes updates on security to accept IEEE 802.1X-based authentication and alignment with G.9960/G.9961 Recommendations.

- **Recommendation ITU-T G.9991 (2019) Amd.2 "High-speed indoor visible light communication transceiver - System architecture, physical layer and data link layer specification - Amendment 2" (under publication)** includes a mechanism to support advanced inter-domain mobility through an external controller.
- Recommendation ITU-T H.644.2 "Virtual content delivery network: Network virtualization" specifies the functional architecture, its related functions and functional blocks that implement content delivery network (CDN) virtualization by utilizing the networking virtualization technologies. Based on the functional architecture and functions, this Recommendation also introduces the various technical solutions of the CDN nodes virtualization utilizing the current network virtualization technologies, such as network function virtualization and software-defined networks. With this Recommendation, a CDN service provider and manufacturer have the opportunity to build their CDN nodes and the related services based on a common virtualized infrastructure, which could extend the delivery service with the lower investments. The quality of multimedia service which is relied on the VCDN solutions will be improved as well.
- Recommendation ITU-T J.1 (revised) "Terms, definitions and acronyms for television and sound transmission and integrated broadband cable networks" compiles all the definitions related to television and sound transmission, and integrated broadband cable networks, and which are in force in J-series and N-series Recommendations developed under the responsibility of SG9. The Recommendation is regularly updated to reflect newly-approved terms and definitions.
- Recommendation ITU-T J.216 (revised) "Second-generation modular headend architecture in systems for interactive cable television services - IP cable modems" defines the second generation of headend architectures for high-speed data-over-cable systems. The second-generation of headend architecture introduces a number of new features that build upon what was present in previous Cabinet DOCSIS Recommendations ITU-T J.223.1 and ITU-T J.223.2. This Recommendation includes key new features for the CMC III device (also known as the remote-PHY device).

  NOTE – The structure and content of this Recommendation have been organized for ease of use through direct reference to the original source material, based on the recognition of CableLabs by ITU as an ITU-T A.5 organization (https://www.itu.int/en/ITU-T/extcoop/Pages/sdo.aspx).
- Recommendation ITU-T J.224 (revised) "Fifth-generation transmission systems for interactive cable television services - IP cable modems" defines the fifth generation of high-speed data-over-cable systems. The fifth-generation transmission systems introduce a number of new features that build upon what was present in previous ITU-T Recommendations namely ITU-T J.112, ITU-T J.122, ITU-T J.222.x-series, and ITU-T J.223.x-series. This Recommendation includes key new features for the physical (PHY) layer and defines full duplex data over cable service interface Specification (DOCSIS) mode of operation, including enhancements to the media access control (MAC) layer protocols as well as requirements for upper layer protocols such as Internet protocol (IP), dynamic host configuration protocol (DHCP), etc. The fifth-

generation cable modem specifications fully incorporate the fourth generation specifications.

NOTE – The structure and content of this Recommendation have been organized for ease of use through direct reference to the original source material, based on the recognition of CableLabs by ITU as an A.5 organization (https://www.itu.int/en/ITU-T/extcoop/Pages/sdo.aspx).

- **Recommendation ITU-T J.225 "Fourth-generation transmission systems for interactive cable television services - IP cable modems"** defines the fourth generation of high-speed data-over-cable systems. The fourth-generation transmission systems introduce a number of new features that build upon what was present in previous Recommendations [ITU-T J.112], [ITU-T J.122], [ITU-T J.222], and [ITU-T J.223]. This Recommendation includes key new features for the physical (PHY) layer and defines Full Duplex DOCSIS® Mode of operation, including enhancements to the media access control (MAC) layer protocols as well as requirements for upper layer protocols (e.g., IP, DHCP, etc.). The fourth-generation cable modem specifications are incorporated fully in this Recommendation. An informative Supplement [b-ITU-T J Suppl. 10] contains the correspondence between the DOCSIS versions and the ITU-T Recommendations revisions and generations.

  NOTE – The structure and content of this Recommendation have been organized for ease of use through direct reference to the original source material, based on the recognition of CableLabs by ITU as an A.5 organization (https://www.itu.int/en/ITU-T/extcoop/Pages/sdo.aspx).

- **Recommendation ITU-T J.299 "Functional Requirements for remote management of cable STB by Auto Configuration Server (ACS)"** describes the functional requirements for Auto Configuration Server (ACS) and STB connected each other for remote maintenance purpose. ACS is usually used to remotely set up and maintain customer premises equipment (CPE) such as STB. The major purpose of the new Recommendation is to specify basic requirements for remote maintenance in the cable TV system.

- **Reecommendation ITU-T J.1203 "The specification of a smart TV operating system"** defines the detailed specification 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.1203 is developed in accordance with the requirements defined in [ITU-T J.1201] and based on the architecture defined in [ITU-T J.1202]. This Recommendation provides a specification for administrations and entities who intend to implement smart TV operating system.

- **Recommendation ITU-T J.1211 "Specifications of IP Video Broadcast (IPVB) for CATV Networks"**: In recent years, IP-based video services have been developed rapidly in CATV networks, especially the highly asymmetric IP-based services with large

bandwidth, such as 4K, 8K and VR, whose single program bandwidth might easily exceed 35Mbps or even up to 100Mbps. This requires huge downlink bandwidth of transmission channels and poses challenges to the existing CATV technologies. For this scenario, it is necessary to propose a solution with low cost and low complexity for meeting the bandwidth requirements of the current asymmetric IP-based video service. This recommendation specifies an IPVB technology, which simply adds a one-way IP-based video broadcast system to the existing low-cost bidirectional CATV networks. The IPVB can greatly increase the bandwidth of downlink programs, and at the same time, have the characteristics of low cost and low complexity. The IPVB in downlink transmits IP-based video streams through broadcast channels which are identified by multicast IP addresses and UDP port numbers, and broadcasts all the IP-based video streams through the CATV networks to all subscribers. By cooperating with the uplink channel provided by the existing bidirectional access networks, it is capable of providing varieties of IP-based high bitrate video services in CATV networks.

- **Recommendation ITU-T J.1600 "Premium Cable Network Platform (PCNP) – Framework"** specifies the framework of the Premium Cable Network Platform (PCNP) for the cable TV and broadband network that exploit the cloud based artificial intelligence and network data to optimize the network and TV services, thus enable the high satisfaction of user's experience of perceptual aspects of services.
- **Recommendation ITU-T L.105/L.87 Amd.1 "Optical fibre cables for drop applications Amendment 1"** aims to provide the latest standard development and application experience of drop cables in China.
- **Recommendation ITU-T L.111 "Optical fibre cables for in-home applications"** aims to provide the requirements of optical fibre cables for in-home applications. Compared to requirements of optical fibre cables in traditional "indoor" applications, the requirements of cables in "in-home" applications have their own specialized characteristics. This Recommendation describes characteristics, cable construction and test methods of optical cables with minimum visibility for in-home applications.
- **Recommendation ITU-T L.151 (revised) "Installation of Optical Fibre Ground Wire (OPGW) cable"** refers to Optical Ground Wire (OPGW) Cable installation. It deals with the factors that should be considered in determining the characteristics of this type of cable, the apparatus that should be used, the precautions that should be taken in handling the reels and the method that should be used to string the cable and joint it.
- **Recommendation ITU-T L.330 "Telecommunication Infrastructure facility management"**: Extensive outside telecommunication infrastructure facilities that support information technology continue to deteriorate from aging. For providing telecommunication services continuously and maintaining infrastructure safety, it is important to maintain their functions based on appropriate facility management as a series of maintenance tasks that includes inspection, diagnosis and repair. Demand is dramatically increasing for cost-effective technologies that can improve maintenance productivity for various types of infrastructures. The purpose of this Recommendation is to identify facilities, items, typical frequency and criteria to be inspected by operators along with fundamentals of telecommunication infrastructure facility management. It is intended for users not only operators that have needs for improving

life-cycle management but also developers that consider applying technologies which are rapidly progressing.

- **Recommendation ITU-T M.3041 "Framework of smart operation, management and maintenance"** introduces framework of smart operation, management and maintenance (SOMM). In this Recommendation, characteristics, scenarios and the functional architecture of SOMM are provided to support service operation, network management, and infrastructure maintenance for both traditional non-SDN/NFV and SDN/NFV aware networks. This Recommendation also describes the relationship of the functional architecture of SOMM with logical layered architecture (LLA) of telecommunications management network (TMN).
- **Recommendation ITU-T M.3164 "Generic information model for on-site telecommunication smart maintenance"** introduces the generic information model for on-site telecommunication smart maintenance. In this Recommendation, the definition and description of the generic information object classes, attributes and the relationship between object classes are provided. This Recommendation also provides examples of each information object class and a diagram of all the example instances.
- **Recommendation ITU-T M.3362 "Requirements for Telecommunication anti-Fraud Management in the TMN"** describes the requirements for telecommunication anti-fraud management in the telecommunication management network (TMN), the functional framework for combating telecommunication fraud management and the functional description. The requirements for telecommunication anti-fraud management include fraud detection management, fraud monitoring management, fraud mitigation management and fraud information sharing management. This Recommendation also describes telecommunication fraud scenarios including nuisance calls and spoofing calls.
- **Recommendation ITU-T M.3363 "Requirements for data management in the TMN"** describes the requirements for data management in the TMN, the functional framework for data management and the functional description. The data refers to the different categories of telecommunication data in BSS and OSS. The requirements for data management include metadata management, data lifecycle management, data quality management, data security management, data configuration management, data service management.
- **Recommendation ITU-T M.3364 "Requirements for on-site telecommunication smart maintenance management function"** introduces requirements for on-site telecommunication smart maintenance management function. In this Recommendation, the requirements for telecommunication smart maintenance function are provided, which include on-site patrol, on-site overhaul, on-site troubleshooting, evaluation of maintenance work, management of maintenance knowledge base, management of service activation function, management of network resource, management of SMAT. This Recommendation also provides use cases of SMAT in TSMS.
- **Recommendation ITU-T M.3373 "Requirements for synergy management of cloud and SDN-based networks"** introduces the management function set and requirements for synergy management of cloud and SDN-based networks. It describes the synergy management structure and the composition of the function set, explains

the functions of each component in the function set. The requirements for the synergy management of cloud and SDN-based networks are also described. In this Recommendation, the general background of the synergy service of cloud and SDN-based networks are also analysed. The benefit of introducing synergy management of cloud and SDN-based networks is explained.

- **Recommendation ITU-T P.381 (revised) "Technical requirements and test methods for the universal wired headset or headphone interface of digital mobile terminals"** specifies critical physical and electrical-acoustical characteristics for the universal headset interface and provides corresponding test methods. Both 3.5 mm and 2.5 mm diameter headset/headphone interfaces have been widely used in digital mobile terminals in recent years. Nowadays, the consumer is free to choose either the headset/headphone originally provided by the terminal manufacturer or others that are offered separately. However, the quality of service (QoS)/quality of experience (QoE) perceived by users is influenced by both the electrical performance of the interface and the compatibility between the terminal and the connected headset/headphone.

- **Recommendation ITU-T P.382 (revised) "Technical requirements and test methods for multi-microphone wired headset or headphone interfaces of digital wireless terminals"**: Headset/headphone interfaces of diameter 3.5 mm and 2.5 mm have been widely used in digital mobile terminals during recent years. Nowadays, the consumer is free to choose either the headset/headphone originally provided by the terminal manufacturer or others that are offered separately. However, the quality of service/quality of experience (QoS/QoE) perceived by users is influenced by both the electrical performance of the interface and the compatibility between the terminal and the connected headset/headphone. Recommendation ITU T P.382 specifies critical physical and electroacoustical characteristics for the universal headset interface with more than four terminals and provides corresponding test methods.

- **Recommendation ITU-T P.501 (revised) "Test signals for use in telephony and other speech-based applications"** describes test signals that are applicable for several purposes in telephony and other speech-based applications. Recommendation ITU-T P.501 gives a wide variety of test signals starting with low complexity test signals up to test signals with a high degree of complexity incorporating many typical parameters of speech. Besides technical signals, such as sine waves or noise, more speech-like signals are described. Recommendation ITU-T P.501 describes the principles of signal construction for each type of test signal. Characteristic properties, such as power density spectra, probability density functions or shaping filter responses, are shown. Recommendation ITU-T P.501 gives an overview of the typical application of the test signals described. This overview is a guideline giving general application rules. The detailed description of the application, however, should be found in the individual Recommendations describing the measurement procedures for specific applications. In order to avoid problems in creating the test signals described, all these test signals are freely available for download from the ITU-T test signals database.

  Annex A proposes two test signals [a pseudo noise sequence (PN-sequence) with a low crest factor and a logarithmically distributed multi-sine wave] for the measurement of terminal coupling loss (TCL). Annex B provides speech files and noise sequences to be used in combination with objective speech quality evaluation

methods. This speech material does not replace the speech material found in Supplement 23 to the ITU T P-series Recommendations. Appendix I provides a description of the processing applied to the speech signals in clause 7.3. This Recommendation includes an electronic attachment containing the set of freely available test signals described in the Recommendation.

- **Recommendation ITU-T P.565 "Framework for creation and performance testing of machine learning based models for the assessment of transmission network impact on speech quality for mobile packet-switched voice services":** The output of the framework is a machine learning based speech quality prediction model, which predicts the impact on the speech quality from the IP transport and underlying transport, as well as the jitter buffer in the end client; thus providing a network centric view on the speech quality service delivered on mobile packet switched networks. This is expressed in terms of a MOS-LQO under the assumption of an otherwise clean transmission, without background noise, automatic gain control, voice enhancement devices, transcoding, bridging, frequency response, clock drift or any other impairment not caused by the IP transport and underlying transport. The models according to this framework use information on the temporal structure of the reference signal to identify the importance of individual sections of the bitstream with regard to speech quality. These models do not perform any perceptual analysis of the recorded speech signal. The framework specifies three modules required for the development of these kinds of metrics: the databases generator module, the machine learning module, and the validation module for the trained model. In addition, database content and the features used by the machine learning algorithm are described. The framework also provides a large set of test vectors, in the form of error (jitter and packet loss) patterns files for learning and validation. The recommendation specifies minimum required performance, as well as conditions and requirements for an independent additional validation for models developed based on the framework. The recommendation also specifies implementation requirements. The models developed based on the framework enable the assessment of transmission network impact on speech quality for mobile packet-switched voice services, and therefore benefit operators and regulators alike with a fast and easy speech quality trend monitoring / benchmarking and troubleshooting. In addition, if predictors according to this framework are used together with perceptual speech quality metrics like P.863, it is possible to identify if the source of problems resides inside or outside the transport network observed by the predictor according to this framework and thus a more detailed analysis of the situation can be achieved and consequently troubleshooting of less obvious degradations such as the ones occurring outside of the transport network (e.g. emerged from automatic gain control, voice enhancement devices, transcoding or analog processing) is enabled.

- **Recommendation ITU-T P.863 Amd.1 "Perceptual objective listening quality prediction - Amendment 1: Revised Appendix III – Prediction of acoustically recorded narrowband speech"** replaces Appendix III which gives advice on how ITU-T P.863 can be used for the prediction of listening quality of acoustically recorded speech data in a narrowband context.

- **Recommendation ITU-T P.918 "Dimension-based Subjective Quality Evaluation for Video Content"** presents guidelines for the conduction of subjective experiments for

the Quality of Experience (QoE) assessment of perceptual video quality dimensions. In addition to scores for the overall video quality, the methodology yields scores for five perceptual dimensions. Each perceptual dimension scores are based on ratings of the amount of degradation present in one system/test condition. The method is designed to be used with naïve subjects. The dimension scores can be used to provide diagnostic information on what may cause the degradation. The perceptual dimensions are described in this document as well as the method to conduct a subjective experiment. Furthermore, we give information about possible test environment and setup, participant instructions, and test material.

- **Recommendation ITU-T P.919 "Subjective test methodologies for 360º video on head-mounted displays"** describes subjective assessment methods for evaluating quality of experience of short (between 10 seconds and 30 seconds) 360º video. It also outlines the characteristics of the source sequences to be used, such as duration, kind of content and number of sequences. Details within this recommendation are expected to change, based on experiments into how best to conduct subjective tests with 360º content.

- **Recommendation ITU-T P.1150 "In-Car Communication Audio Specification"** includes communication requirements for in-car communication (ICC). The aim of this Recommendation is to set a base level of function and quality. This Recommendation is aimed at providing an improved communication between all occupants in a motor vehicle. Furthermore, it will ensure the ICC operates to a quality such that the motor vehicle driver does not feel it necessary to turn their head to amplify their voice when talking to other passengers and thus ICC can aid in preventing driver distraction. ICC will utilize integrated microphones and speakers in the motor vehicle cabin to amplify conversation. To meet these requirements, the use of audio zones within a motor vehicle cabin for speech communications between audio zones, and tests to ensure good speech intelligibility and quality between those zones are defined. This Recommendation covers requirements and test methods for:

  1. system stability
  2. speech intelligibility
  3. speech quality
  4. talker localization accuracy

  The use of wearable headphones (audiophones) by driver or passengers is outside the scope of this Recommendation.

- **Recommendation ITU-T P.1204 "Video quality assessment of streaming services over reliable transport for resolutions up to 4K"** provides the introductory document for a set of documents that describe model algorithms for monitoring the video quality for streaming using reliable transport (e.g. HTTP-based adaptive streaming over TCP, QUIC). The standard comprises different variants of models for sequence-related (between 5 and 10 sec.) and per-1-second video-quality estimation. The variants differ in the type of input information they use: Bitstream-based, pixel-based, and hybrid (using both bitstream and pixel information). In principle, the per-1-second outputs of these video-quality models can be used together with an audio-quality 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. ITU-T Recs. P.1203, P.1203.2, P.1203.3). The respective ITU-T work item has formerly been referred to as "P.NATS Phase 2", and was conducted in collaboration between ITU-T Study Group 12 and the Video Quality Experts Group (VQEG).

The structure of the set of recommendations reflects the different functionality of modules described in each document:

- ITU-T P.1204: Introductory document (this Recommendation)
- DRAFT P.1204.1: Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to transport information (under development)
- DRAFT P.1204.2: Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to video frame information (under development)
- ITU-T P.1204.3: Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to full bitstream information
- ITU-T P.1204.4: Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to full and reduced reference pixel information
- ITU-T P.1204.5: Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to transport and received pixel information.

❖ **Recommendation ITU-T P.1204.3 "Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to full bitstream information"** describes a bitstream-based mode 3 video quality model for monitoring the video quality for streaming using reliable transport (e.g. HTTP-based adaptive streaming over TCP, QUIC). The estimate is validated for videos encoded with H.264, H.265 or VP9 codecs at any resolution up to 4K/UHD resolution for PC monitors and TV and up to QHD (2560x1440) for Smartphone and Tablet displays. The standard provides sequence-related (between 5 to 10 sec.) and per-1-second video-quality estimation. In principle, the per-one-second outputs of this video-quality model 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. ITU-T Recs. P.1203, P.1203.2, P.1203.3). The respective ITU-T work item has formerly been referred to as "P.NATS Phase 2", and was conducted in collaboration between ITU-T Study Group 12 and the Video Quality Experts Group (VQEG).

The ITU-T P.1204.3 Recommendation addresses three application areas:

- Large-screen presentation as with fixed-network video streaming
- Mobile streaming on handheld devices such as smartphones
- Presentation on tablet-type devices.

- **Recommendation ITU-T P.1204.4 "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/full-reference video quality estimation model for P.1204 for monitoring the video quality for streaming using reliable transport (e.g. HTTP-based adaptive streaming over TCP, QUIC). The estimate is validated for video encoded with H.264, H.265 or VP9 codecs at any resolution up to 4K/UHD (3840x2160) resolution for PC monitor and TV and up to QHD (2560x1440) for Smartphone and Tablet displays. The standard provides sequence-related (between 5 to 10 sec.) 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. ITU-T Recs. P.1203, P.1203.2, P.1203.3). The respective ITU-T work item has formerly been referred to as "P.NATS Phase 2", and was conducted in collaboration between ITU-T Study Group 12 and the Video Quality Experts Group (VQEG).

  The ITU-T P.1204.4 Recommendation addresses three application areas:

  – Large-screen presentation as with fixed-network video streaming
  – Mobile streaming on handheld devices such as smartphones
  – Presentation on tablet-type devices.

- **Recommendation ITU-T P.1204.5 "Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to transport and received pixel information"** describes the Hybrid no-reference video quality estimation model for P.1204 for monitoring the video quality for streaming using reliable transport (e.g. HTTP-based adaptive streaming over TCP, QUIC). The estimate is validated for videos encoded with H.264, H.265 or VP9 codecs at any resolution up to 4K/UHD-1 resolution for PC monitors and TV and up to QHD (2560x1440) for Smartphone and Tablet displays. The standard provides sequence-related (between 5 to 10 sec.) 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. ITU-T Recs. P.1203, P.1203.2, P.1203.3). The respective ITU-T work item has formerly been referred to as "P.NATS Phase 2", and was conducted in collaboration between ITU-T Study Group 12 and the Video Quality Experts Group (VQEG).

  The ITU-T P.1204-series of Recommendations addresses three application areas:

  - Large-screen presentation as with fixed-network video streaming
  - Mobile streaming on handheld devices such as smartphones
  - Presentation on tablet-type devices.

- **Recommendation ITU-T P.1203.3 Amd.1 "Parametric bitstream-based quality assessment of progressive download and adaptive audiovisual streaming services over reliable transport - Quality integration module Amendment 1 - Adjustment of**

the audiovisual quality" introduces an adjustment of the audiovisual quality of ITU-T P.1203.3 for the case of very low audio quality and long stalling events.

- **Recommendation ITU-T P.1401 (revised) "Methods, metrics and procedures for statistical evaluation, qualification and comparison of objective quality prediction models":** A stable and self-sustained statistical evaluation procedure is required in the development of objective quality algorithms. This is required regardless of whether the algorithms will be used for estimating subscriber perception of voice, video, audio or multimedia quality. Recommendation ITU-T P.1401 presents a framework for the statistical evaluation of objective quality algorithms regardless of the assessed media type.
- **Recommendation ITU-T P.1502 "Methodology for QoE testing of digital financial services"** is based on the end-to-end QoS KPI definitions first published in [b-DFS TR]. It details the methodology and connects to a field test using this methodology, which has been conducted in Ghana in the first half of 2018. Money transfer from end user's devices to other devices or to other entities has become an important element of everyday life in many countries. This service, however, relies on the functionality of mobile networks. Therefore, a connection exists between the functioning, QoS and QoE of money transfer services, and the QoS and proper functioning of those mobile networks, and respective quality metrics and testing methodologies need to be defined. The main part of the present Recommendation describes the testing methodology.
- **Recommendation ITU-T Q.3055 "Signalling protocol for Heterogeneous IoT gateways"** describes the signalling protocol for heterogeneous IoT gateways.
- **Recommendation ITU-T Q.3056 "Signalling procedures of the probes to be used for remote testing of network parameters"** describes architecture and signaling procedures to be used for remote testing of network parameters utilizing probes. These procedures include the execution of testing, testing profile templates, storing of measurement results, and authorized access for users to test results. These procedures enable a probe to function as a "black box" recording all events on the subscriber side, and suitable for a trusted system in resolving disputes between various ICT stakeholders.
- **Recommendation ITU-T Q.3058 "Signalling architecture of orchestration in NGNe":** The orchestration in NGNe is of great significance for next generation network evolution, because it takes the coexistence and corporation of traditional network such as NGN and SDN/NFV enabled network into consideration. This Recommendation specifies the mapping of reference points to interfaces in the signalling architecture of orchestration in NGNe, and provides the signalling requirements of the interfaces and defines the protocols used for interfaces. The descriptions of the requirements, the functional architecture and the reference points of orchestration in NGNe are aligned with [ITU-T Y.2323] and [ITU-T Y.2324].
- **Recommendation ITU-T Q.3059 "Signalling requirements for service function discovery"** specifies the signalling requirements for service function discovery based on its functional architecture. The signalling is for service function path controller to discover and select the service function.

- **Recommendation ITU-T Q.3060 "Signalling architecture of the fast deployment emergency telecommunication network to be used in a natural disaster" (under approval)**: In the last decade, climate change and natural disasters affected most of the countries all over the globe. The consequence such as tropical storms, floods and droughts directly affect social and various industrial sectors including ICT.

  In this regard, the deployment of special emergency telecommunication network becomes a first and important aid for civilians afflicted by natural disasters. The rapid deployment of such networks is fundamental.

  Currently, the emergency systems, which are used in a natural disaster cases, are based on the existing technologies such as space-based networks (e.g. Iridium, etc.). However, in forthcoming 5G and IoT era, there are some technologies which may play an important role in helping to provide wide number of ICT services from simple voice/video communication up to telemetry exchange, to name a few. All these services which are rapidly deployed in harmed country may sufficiently change the situation and help to save life of victims of natural hazard events.

  The goal of this Recommendation is to describe the functional elements, services and signaling architecture of emergency telecommunication network which can be rapidly deployed in a country affected by a natural disaster.

- Recommendation ITU-T Q.3643 "Signalling architecture of distributed infrastructure ENUM networking for IMS" defines the framework and signalling architecture for distributed ENUM networking in support of IMS interconnection. Based on the signalling architecture of distributed ENUM model, it specifies the signalling procedures of ENUM profile management and ENUM resolution. The signalling requirements and protocols to be applied for interfaces of distributed ENUM networking are addressed as well.

- Recommendation ITU-T Q.3644 "Requirements for signalling network analyses and optimization in VoLTE" specifies the requirements for signalling network analyses and optimization in Voice over LTE (VoLTE) in which the signalling network refers to the network entities and the signalling exchange which are related to telecommunications services. This Recommendation covers the aspects of overview on signalling network, requirements for signalling collecting, requirements for signalling network analyses, requirements for signalling network optimization and general security considerations in VoLTE.

- Recommendation ITU-T Q.3645 "Protocol at interface between two distributed ENUM servers for IMS" defines protocol at the interface between two Distributed ENUM Servers (DES) of distributed ENUM system in support of IMS interconnection. Based on the functions and signalling requirements defined in [ITU T Q.3643], this Recommendation provides the reference model, procedures, protocol, and message specification for the interface between two DES.

- Recommendation ITU-T Q.3719 "Signalling requirements for the separation of control plane and user plane in vBNG (Broadband Network Gateway)" specifies architecture, signalling requirements and information flows for the separation of control plane and user plane in vBNG (Broadband Network Gateway).

- **Recommendation ITU-T Q.3720 "Procedures for vBNG acceleration with programmable acceleration card"** specifies the framework, working modes, and procedures for vBNG acceleration with programmable acceleration card.
- **Recommendation ITU-T Q.3915 "Set of parameters of vBNG for monitoring"**: Virtual Broadband Network Gateway has been developed as an entry point for telecommunication providers to introduce network function virtualization (NFV). This draft Recommendation focuses on monitoring of virtual Broadband Network Gateway (vBNG) in NFV. This Recommendation provides the set of parameters that indicate the state and event of vBNG.
- **Recommendation ITU-T Q.3916 "Signalling requirements and architecture for the Internet service quality monitoring system":** Quality of Service (QoS) of Internet services (e.g., web and OTT video) has been attracting attentions of the Internet Service Provider (ISP) and the Internet Content Provider (ICP). To evaluate the above QoS, this Recommendation defines the architecture and signalling requirements of the Internet Service Quality Monitoring (SQM) system. Components, interfaces and interactions among components of the SQM system are described in detail in this Recommendation.
- **Recommendation ITU-T Q.3961 "Parameters for evaluating bottleneck of web-browsing service"**: If the QoS of web-browsing service drops, ISPs and ICPs hope to be able to immediately find the reasons, fix the faults and improve web-browsing service. To achieve the above aims, this Recommendation specifies parameters for evaluating bottleneck of the web-browsing service. These parameters can be divided into four groups: parameters in the application layer, parameters in the transportation layer, parameters in the network layer and the characteristic parameters. The relationship between these parameters is also introduced in this Recommendation.
- **Recommendation ITU-T Q.4064 "Interoperability testing requirements of virtual Broadband Network Gateway"** aims to specify virtual BNG (vBNG) interoperability testing requirements. Firstly, as a basic background, this Recommendation introduces the overview of vBNG and interoperability testing of vBNG, which includes but not limited to the definition, characteristics, general capabilities of vBNG as well as the overview of interoperability testing of vBNG. The description of use cases of vBNG will be provided as appendix. Base on analysis of involved vBNG capabilities in use cases, the corresponding derived requirements of vBNG's interoperability testing will be introduced.
- **Recommendation ITU-T Q.4066 "Testing procedures of Augmented Reality applications"**: Augmented reality (AR) is a collection of new technologies that perform the function of displaying digital information to a user through special devices (smartphone, AR glasses, projectors, etc.) allowing data to be displayed in visual (3D objects, video, images, etc.), audio or text format alongside real-world objects. Besides, augmented reality offers the possibility of physical objects and virtual entities, which can make additional delays in the process of data transformation. Because testing procedures for augmented reality are significantly different from traditional applications, this Recommendation defines approaches for testing for various applications of AR.

- **Recommendation ITU-T Q.4100 "Hybrid peer-to-peer (P2P) communications: Functional architecture"** specifies functional architecture of hybrid peer-to-peer overlay networking architecture. The hybrid P2P network makes use of advantages of tree-based overlay network and mesh-based overlay network. This Recommendation specifies related components with detailed composition of functional entities based on their atomic functionalities. This also specifies the reference points to be used for further protocol specification among those components. In addition, this Recommendation provides high-level information flows for various application services based on hybrid overlay network such as IoT, blockchain and multimedia live streaming.

- **Recommendation ITU-T Q.5002 "Signalling requirement and architecture for media service entity attachment":** Media service providers for different service technologies have always been developing independently in order to satisfy the requirements of their platform and become different verticals, which leads to significant drawbacks and inefficiencies in terms of development. Media service providers using cloud capability have to deal with specific signalling flows for providing media service using an interface, which significantly will increase the complexity for the provider to use different cloud infra providers. Therefore, there is a strong necessary to requirement and architecture for a standard signalling convergence of different cloud infra providers in future media service. This Recommendation specifies the signalling requirement and architecture for media service entity attachment. This Recommendation mainly describes high level signalling requirements and specific requirements for media infra layer, media service layer, API layer and orchestration layer.

- **Recommendation ITU-T Q.5052 "Addressing mobile devices with duplicate unique identifier"**: The presence and detection of duplicate unique identifiers on mobile networks and identifying the authenticity of a device are two key problems that stakeholders are looking to find solutions for. The detection mechanisms discussed in this documentation are based on post-processing mobile network data to identify devices for blocking purposes based on criteria defined by individual national regulatory bodies. Through incorporation of one or more of these mechanisms, systems can identify and address the problem that duplicate or cloned devices present to governments, operators, and consumers. A combination of one or more methodologies described in this document can be employed at any given time. The decision regarding the methodology or methodologies to employ will determine the level of effectiveness of a country's detection mechanism.

- **Recommendation ITU-T X.609.5 (revised) "Managed P2P communications: Overlay management protocol"** specifies a multimedia streaming overlay management protocol (MSOMP) that runs on the interface among entities of managed P2P communications. The management functionalities covered in this Recommendation include overlay network management including creation, modification, and termination and peer management including membership control and information maintenance. The protocol is applicable to various services such as multimedia streaming service and content distribution service over managed P2P communications. This Recommendation provides protocol operations and message formats.

- **Recommendation ITU-T X.609.8 "Managed P2P communications: Management protocol for live data sources"** describes the management protocol for live data sources in MP2P communications which is an overlay protocol runs in application layer to manage a live data from multiple data source. The examples of live data generated from data source include a live sensor data, a live CCTV stream and they can be applicable to disaster recovery, autonomous vehicle, etc. This Recommendation specifies the identification, functions and the procedures of the data sources involved.
- **Recommendation ITU-T X.609.9 "Managed P2P communications: Overlay content management protocol"** specifies overlay content management protocol that supports of managing overlay content to be distributed over managed peer-to-peer network. This protocol is used between peer and IXS (index server) to manipulate the meta information needs to be shared among peers within a same overlay network. This Recommendation provides protocol message syntax and basic operations with information flows. In addition, this provides extended operations for using this protocol for various application services such as content distribution, multimedia streaming and data streaming.
- **Recommendation ITU-T X.609.10 "Managed P2P communications: Signalling requirements for data streaming"** defines the signalling requirements for data streaming that runs on the reference points among related entities of the managed P2P communications. Data streaming service is a service that delivers the data which a data source generates continuously or on a specific event. Different from audio or video frames in multimedia streaming service, each data generated by the data source in the data streaming service can be processed independently. This Recommendation also addresses service procedures for providing data streaming services based on managed peer-to-peer networks.
- **Recommendation ITU-T X.677 "Identification mechanism for unmanned aerial vehicles using object identifiers"** analyses the requirements for a full life-cycle management and operating identity recognition of unmanned aerial vehicles (UAVs) with security considerations. It also specifies an identification mechanism for UAVs using object identifiers (OIDs), including detailed specifications of assignment rules and registration procedures of OIDs used for UAVs.
- **Recommendation ITU-T X.680 | ISO/IEC 8824-1 (revised) "Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation" (under approval)** provides a notation called Abstract Syntax Notation One (ASN.1) for defining the syntax of information data. It defines a number of simple data types and specifies a notation for referencing these types and for specifying values of these types. The ASN.1 notations can be applied whenever it is necessary to define the abstract syntax of information without constraining in any way how the information is encoded for transmission.
- **Recommendation ITU-T X.681 | ISO/IEC 8824-2 (revised) "Information technology – Abstract Syntax Notation One (ASN.1): Information object specification" (under approval)** provides the ASN.1 notation which allows information object classes as well as individual information objects and sets thereof to be defined and given reference names. An information object class defines the form of a conceptual table (an

information object set) with one column for each field in the information object class, and with each complete row defining an information object.

- **Recommendation ITU-T X.682 | ISO/IEC 8824-3 (revised) "Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification" (under approval)** provides the ASN.1 notation for the general case of constraint and exception specification by which the data values of a structured data type can be limited. The notation also provides for signalling if and when a constraint is violated.
- **Recommendation ITU-T X.683 | ISO/IEC 8824-4 (revised) "Information technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications" (under approval)** defines the provisions for parameterized reference names and parameterized assignments for data types which are useful for the designer when writing specifications where some aspects are left undefined at certain stages of the development to be filled in at a later stage to produce a complete definition of an abstract syntax.
- **Recommendation ITU-T X.690 | ISO/IEC 8825-1 (revised) "Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)" (under approval)** defines a set of Basic Encoding Rules (BER) that may be applied to values of types defined using the ASN.1 notation. Application of these encoding rules produces a transfer syntax for such values. It is implicit in the specification of these encoding rules that they are also used for decoding. This Recommendation | International Standard defines also a set of Distinguished Encoding Rules (DER) and a set of Canonical Encoding Rules (CER) both of which provide constraints on the Basic Encoding Rules (BER). The key difference between them is that DER uses the definite length form of encoding while CER uses the indefinite length form. DER is more suitable for the small encoded values, while CER is more suitable for the large ones. It is implicit in the specification of these encoding rules that they are also used for decoding.
- **Recommendation ITU-T X.691 | ISO/IEC 8825-2 (revised) "Information technology – ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)" (under approval)** describes a set of encoding rules that can be applied to values of all ASN.1 types to achieve a much more compact representation than that achieved by the Basic Encoding Rules and its derivatives (described in Rec. ITU-T X.690 | ISO/IEC 8825-1).
- **Recommendation ITU-T X.692 | ISO/IEC 8825-3 (revised) "Information technology – ASN.1 encoding rules: Specification of Encoding Control Notation (ECN)" (under approval)** defines the Encoding Control Notation (ECN) used to specify encodings (of ASN.1 types) that differ from those provided by standardized encoding rules such as the Basic Encoding Rules (BER) and the Packed Encoding Rules (PER).
- **Recommendation ITU-T X.693 | ISO/IEC 8825-4 (revised) "Information technology – ASN.1 encoding rules: XML Encoding Rules (XER)" (under approval)** specifies rules for encoding values of ASN.1 types using the Extensible Markup Language (XML).
- Recommendation ITU-T Y.1540 (revised) "Internet protocol data communication service - IP packet transfer and availability performance parameters" defines parameters that may be used in specifying and assessing the performance of speed, accuracy, dependability and availability of IP packet transfer of regional and

international Internet protocol (IP) data communication services. The defined parameters apply to end-to-end, point-to-point IP service and to the network portions that provide, or contribute to the provision of, such service in accordance with the normative references specified in clause 2. Connectionless transport is a distinguishing aspect of the IP service that is considered in this Recommendation. Following over 20 years as an in-force Recommendation, the 2019 Edition recognizes many changes in the design of IP services and in the protocols employed by end-users. It introduces the new Annex A that defines IP Capacity parameters in ways that cater toward assessment, and provides requirements for methods of measurement of IP Capacity. This new Annex is the result of years of study, and application of ITU-T Study Group 12 principles of accurately evaluating performance parameters and methods of measurement against a "ground truth" reference in laboratory and field measurements.

- **Recommendation ITU-T Y.1540 Amd.1 "Internet protocol data communication service - IP packet transfer and availability performance parameters - Amendment 1 - Amendment 1: New Annex B – Additional search algorithm for IP-based capacity parameters and methods of measurement"**: The latest Edition of Recommendation ITU-T Y.1540 incorporates many updates based on the plan to qualify and compare access measurement metrics, methods, models, and tools in a stable and repeatable laboratory environment. Amendment 1 introduces Annex B, which provides a second, more capable search algorithm for the IP capacity method of measurement defined in Annex A. Annex B provides a second, more capable search algorithm for the IP capacity method of measurement defined in Annex A.

- **Recommendation ITU-T Y.2029 Amd.1 "A multi-path transmission control in multi-connection - Amendment 1 - New Annex A: Network equipment based multi-path transmission"** provides the text of network equipment based multi-path transmission including the necessity and technical considerations, capability requirements, scenarios, and information flows for supporting network equipment based multi-path transmission.

- **Recommendation ITU-T Y.2244 "Service model for the Cultivation Plan Service at the pre-production stage":** The Cultivation Plan Service at the pre-production stage is critical in that it supports agricultural producers' decision by providing related information such as predicted crop production or expected profits for consulting or other agricultural information when they plan to cultivate. A service model is required to derive necessary service features that support these missions. Therefore, the service model for the Cultivation Plan Service including reference architecture, service requirements, and related capabilities is described in this Recommendation.

- **Recommendation ITU-T Y.2245 "Service model of the Agriculture Information based Convergence Service"**: Agricultural data is the key foundation for Smart Farm models, in which a wide range of Information and Communication Technology (ICT) such as IoT and Big Data are converged, to be operated and managed. Given the fact that every single stage in Smart Farm models from crop growing to selling requires appropriate data, it is crucial to have a well-established service model for data collection and its provision. This service model should gather and process data before providing it for users to enhance their farm business. By convergence of various data collected from each stage of production, the model should ensure higher quality of

service. During the production stage, the convergence services are provided to increase crop quality and yield and reduce farm maintenance costs. This Recommendation provides more details about the service model.

- **Recommendation ITU-T Y.2324 "Functional architecture of orchestration in NGNe":** The orchestration in NGNe is of great significance for next generation network evolution, because it takes the coexistence and corporation of traditional network such as NGN and SDN/NFV enabled network into consideration. This draft Recommendation provides the general functional architecture of the orchestration in NGNe, specifies its functional entities and defines the functionalities of these functional entities, and provides descriptions of all reference points of orchestration in NGNe.
- **Recommendation ITU-T Y.2342 "Scenarios and Capability Requirements of Blockchain in Next Generation Network Evolution"** presents an analysis of the motivations and scenarios of blockchain used in the Next Generation Network Evolution (NGNe). The general high-level requirements of blockchain in NGNe are put forward. Detailed descriptions of the use cases are listed in the appendix. This Recommendation provides the framework of the blockchain for NGNe and specifies the capability requirements that meet the needs of Next Generation Network (NGN) and the blockchain framework. The framework provided in this Recommendation is intended for NGNe as defined in Recommendation ITU-T Y.2340, however, it could be applied as appropriate to other types of telecom networks (e.g. IMT-2020 and Future Network).
- **Recommendation ITU-T Y.4210 "Requirements and use cases for universal communication module of mobile IoT devices":** As an important part of mobile Internet of things (IoT) devices, the universal communication module is a key component to achieve economies of scale for mobile IoT devices, accelerate the progress of research and development, and promote the application of new mobile IoT technologies. Recommendation ITU-T Y.4210 specifies requirements for a universal communication module of mobile IoT devices. Related use cases are provided in Appendix I. Universal communication module reference types are described in Appendix II.
- **Recommendation ITU-T Y.4462 "Requirements and functional architecture of open IoT identity correlation service":** Open Internet of things (IoT) identity correlation service (ICS), or open IoT ICS, is a service to map identities among devices, third party services, and transactions. Recommendation ITU-T Y.4462 specifies the reference architecture of open IoT ICS which supports Internet of things (IoT) devices to access multiple third party service providers. This Recommendation clarifies the concept of the open IoT ICS, identifies its basic capabilities and common requirements and also provides the reference architecture and relevant high-level common procedures for open IoT ICS.
- **Recommendation ITU-T Y.4463 "Framework of delegation service for IoT devices":** Recommendation ITU-T Y.4463 is a framework of the delegation service for transferring ownership (i.e., access rights to the Internet of things (IoT) devices) among authorized IoT devices. This Recommendation gives an overview and types of

delegation service in IoT environment. It also describes the requirements and architectural models of delegation service.

- **Recommendation ITU-T Y.4470 "Reference architecture of artificial intelligence service exposure for smart sustainable cities":** This Recommendation introduces artificial intelligence service exposure (AISE) for smart sustainable cities (SSC), and provides the common characteristics and high-level requirements, reference architecture and relevant common capabilities of AISE. AISE is one of the basic supporting functional entities for smart sustainable cities, with which SSC services can use uniform reference points (exposed by AISE) to integrate and access the AI capabilities of AI services (e.g., machine learning services for image recognition, natural language processing services, traffic prediction services etc.). In addition, AISE can collect and open SSC data, and it supports AI services to train and perform AI capabilities in AISE in SSCs.
- **Recommendation ITU-T Y.4474 "Functional architecture for IoT services based on Visible Light Communications":** This Recommendation describes the functional architecture for Internet of Things (IoT) services based on Visible Light Communications (VLC), which includes functional requirements, functional architecture, messages and information flows.
- **Recommendation ITU-T Y.4475 "Lightweight intelligent software framework for IoT devices":** The Recommendation addresses the concept of the lightweight intelligent software framework (LISF) which supports IoT applications requiring intelligent processing, and enables it working on resource-limited IoT devices. It identifies general requirements and provides a functional architecture of LISF based on the IoT reference model [ITU-T Y.4000].
- **Recommendation ITU-T 4459 "Digital entity architecture framework for IoT interoperability":** Recommendation ITU-T Y.4459 introduces a digital entity architecture and its prospective in addressing interoperability and security among Internet of things (IoT) applications. This Recommendation defines an architecture framework for information-oriented services that makes use of existing infrastructures, including the Internet infrastructure, to enhance secure and managed information sharing over a distributed networking environment. It defines an architecture framework for information management based on the use of digital entities, and a common set of secure services that will help the registration, discovery, resolution and dissemination of such digital entities. The set of services is designed to facilitate sharing across any storage boundaries, any heterogeneous application boundaries and any organization boundaries.

  A digital entity architecture defines a minimum set of needed architectural components and services to provide a generic information and service interoperability. It will facilitate the interoperability of identification, description, representation, access, storage and security of IoT devices. This architecture framework encourages a common security and management interface across different IoT applications.

  Under a digital entity architecture, information represented in digital form is structured as digital entities, each of which has an associated unique persistent

identifier. However, metadata contained in the digital entities (e.g., location of the object) could be updated without changing its identifier.

The identifier allows the digital entities to be identified and discovered, regardless of where they are located or stored. Digital entities are not confined within any particular application boundary and may be moved from host to host, accessed from application to application, shared from organization to organization, without losing its ownership or management control, in order to enhance interoperability. A digital entity's data model allows ownership and access control information to be defined by data owners independently of any specific applications.

This Recommendation can be used with different identification and addressing protocols (e.g., Internet protocol (IP) and/or non-IP based networks).

- **Recommendation ITU-T 4807 "Agility by design for Telecommunications/ICT Systems Security used in the Internet of Things":** Recommendation ITU-T Y.4807 addresses possible improvement of security and stability of the Internet of things by ensuring the supporting telecommunication/information and communication technology (ICT) systems and related infrastructure – protocols, standards, etc. – have the flexibility to keep up with advances in telecommunication/ICT security and cryptography. This Recommendation intentionally does not provide guidance on specific cryptosystems, standards or algorithms.
- **Recommendation ITU-T 4808: "Digital entity architecture framework to combat counterfeiting in IoT":** Recommendation ITU-T Y.4808 is intended to provide a solution framework employing digital entity architecture to combat the use of counterfeit Internet of things (IoT) devices worldwide. There are challenges related to the use and circulation of counterfeit devices in the market, including adverse consequences for users, governments and the private sector.
- **Recommendation ITU-T Z.100 (revised) "Specification and Description Language - Overview of SDL-2010"** introduces the Specification and Description Language, intended for unambiguous specification and description of telecommunication systems. The scope of the Specification and Description Language is elaborated in clause 1. The ITU-T Z.100 series for SDL-2010 together form a reference manual for the language. The objective of this Recommendation is to provide an introductory overview to the language and the rest of the reference manual contained in the ITU-T Z.100 series for SDL-2010. The language introduced in this document is more fully defined in other Recommendations in the ITU-T Z.100 series for SDL-2010.
- **Recommendation ITU-T Z.100 Annex F1 (revised) "Specification and Description Language - Overview of SDL-2010 - Annex F1: SDL-2010 formal definition: General overview"** provides the motivation for and the main objectives of a formal semantics definition for SDL-2010. It gives an overview of the structure of the formal semantics, and it also contains an introduction to the Abstract State Machine (ASM) formalism, which is used to define the SDL-2010 semantics.
- **Recommendation ITU-T Z.100 Annex F2 (revised) "Specification and Description Language – Overview of SDL 2010 - Annex F2: SDL 2010 formal definition: Static semantics"** describes the static semantic constraints of SDL-2010, the mapping to the abstract grammar and the transformations identified by the 'Model' clauses of

Recommendations ITU-T Z.101, Z.102, Z.103, Z.104, Z.105 and Z.107, that are included by reference in Recommendation ITU-T Z.100.

- **Recommendation ITU-T Z.100 Annex F3 (revised) "Specification and Description Language – Overview of SDL 2010 - Annex F3: SDL 2010 formal definition: Dynamic semantics"** defines the SDL 2010 dynamic semantics.
- **Recommendation ITU-T Z.101 (revised) "Specification and Description Language - Basic SDL-2010"** defines the basic features of the Specification and Description Language. Together with Recommendations ITU-T Z.100, ITU-T Z.102, ITU-T Z.103, ITU-T Z.104, ITU-T Z.105, ITU-T Z.106 and ITU-T Z.107, this Recommendation is part of a reference manual for the language. The language defined in this document covers the essential features of the language, which is further defined in other Recommendations in the ITU-T Z.100 series.
- **Recommendation ITU-T Z.102 (revised) "Specification and Description Language - Comprehensive SDL-2010"** defines the comprehensive features of the Specification and Description Language. Together with Recommendations ITU-T Z.100, ITU-T Z.101, ITU-T Z.103, ITU-T Z.104, ITU-T Z.105, ITU-T Z.106 and ITU-T Z.107, this Recommendation is part of a reference manual for the language. The language defined in this document covers features of the language not included in Basic SDL-2010 in Recommendation ITU-T Z.101. These features provide comprehensive coverage of abstract grammar of the language except some data features covered in ITU-T Z.104 (and ITU-T Z.107 for object-oriented data).
- **Recommendation ITU-T Z.103 (revised) "Specification and Description Language - Shorthand notation and annotation in SDL-2010"** defines the shorthand and annotation features of the Specification and Description Language. Together with Recommendations ITU-T Z.100, ITU-T Z.101, ITU-T Z.102, ITU-T Z.104, ITU-T Z.105, ITU T Z.106 and ITU-T Z.107, this Recommendation is part of a reference manual for the language. The language defined in this document covers features of the language not included in Basic SDL 2010 in Recommendation ITU-T Z.101 or Comprehensive SDL 2010 in Recommendation ITU-T Z.102. Features defined in this Recommendation either do not have their own abstract grammar and are transformed to concrete grammar defined by Recommendations ITU T Z.101, ITU T Z.102 and ITU-T Z.104 (and ITU-T Z.107 for object oriented data), or are annotations with no formal meaning.
- **Recommendation ITU-T Z.104 (revised) "Specification and Description Language - Data and action language in SDL-2010"** defines the data features of the Specification and Description Language so that data definitions and expressions are well defined. Together with Recommendations ITU-T Z.100, ITU-T Z.101, ITU-T Z.102, ITU-T Z.103, ITU-T Z.105, ITU-T Z.106 and ITU-T Z.107, this Recommendation is part of a reference manual for the language. The language defined in this Recommendation partially overlaps features of the language included in Basic SDL-2010 in Recommendation ITU-T Z.101 and used in Comprehensive SDL-2010 in Recommendation ITU-T Z.102 and the features of Recommendation ITU-T Z.103.
- **Recommendation ITU-T Z.105 (revised) "Specification and Description Language - SDL-2010 combined with ASN.1 modules"** defines how Abstract Syntax Notation One (ASN.1) modules are usable in combination with Specification and Description Language 2010 (SDL-2010). This text replaces Recommendation ITU-T Z.105 (2003) to

align with Recommendations ITU-T Z.100, ITU-T Z.101, ITU-T Z.102, ITU-T Z.103, ITU-T Z.104, ITU-T Z.106 and ITU-T Z.107 for SDL-2010. Recommendation ITU-T Z.105 (2003) replaced the semantic mappings from ASN.1 to SDL-2000 defined in Recommendation ITU-T Z.105 (1999). The use of ASN.1 notation embedded in the Specification and Description Language previously defined in Recommendation ITU-T Z.107 (1999) is not defined by this Recommendation. The main area of application of this Recommendation is the specification of telecommunication systems. The combined use of SDL-2010 and ASN.1 permits a coherent way to specify the structure and behaviour of telecommunication systems, together with data, messages and encoding of messages that these systems use.

This version of Recommendation ITU-T Z.105 includes necessary alignments with ASN.1:2002 Recommendations, mapping of XML values, improved mapping of bit string values and mapping of relevant ASN.1 constructs for extensions.

- **Recommendation ITU-T Z.106 (revised) "Specification and Description Language - Common interchange format for SDL-2010"** defines the common interchange format of Specification and Description Language (SDL-CIF). The SDL-CIF is intended for the interchange of graphical SDL-2010 specifications (SDL-GR) made on different tools that do not use the same storage format. Prior to the definition of SDL-CIF, the textual phrase representation of SDL-2010 (SDL-PR) was used to interchange specifications with the disadvantage that all graphical information was lost, making the same specifications often look very dissimilar in different environments. With the SDL-CIF, this disadvantage is reduced to a minimum, as it contains most of the graphical information. The SDL-CIF improves the independence from specific tool vendors and allows standards bodies to accept specifications in SDL-CIF irrespective of the tool they use for their internal work. This also improves productivity by allowing specifications to be made on the accustomed tool. All SDL-2010 tool vendors are encouraged to provide facilities for importing and exporting SDL-CIF.

  This Recommendation defines how SDL-2010 descriptions are stored in order to be interchanged between tools coming from different vendors. It does not take into account the message sequence chart (MSC) notation. SDL-CIF is an optional part of SDL-2010. SDL-CIF is based on the SDL-PR syntax, the textual phrase representation of SDL-2010 also defined in this Recommendation. SDL-CIF is readable and written by tools as well as users. All the constructs available in SDL-2010 are able to be expressed in graphical form or in the purely textual SDL-PR form. Constraints on graphical presentation are expressed in SDL-CIF by adding specific annotations to SDL-PR. As a result, most SDL-PR descriptions are legal SDL-CIF descriptions. SDL-CIF is an open storage format as it includes a mechanism of tool-specific directives. This mechanism allows an SDL-CIF-compliant tool to extend the format by adding specific information. SDL-CIF is also easily implemented and provides tool vendors with two levels of tool conformance and concepts of mandatory and optional directives.

- **Recommendation ITU-T Z.107 (revised) "Specification and Description Language - Object-oriented data in SDL-2010"** defines the object-oriented data features of the Specification and Description Language building on the foundation of the data definitions and expressions defined in Recommendation ITU-T Z.104. Together with Recommendations ITU-T Z.100, ITU-T Z.101, ITU-T Z.102, ITU-T Z.103, ITU-T Z.104, ITU-T Z.105 and ITU-T Z.106, this Recommendation is part of a reference manual for the

language. The language defined in this Recommendation partially overlaps features of the language included in Basic SDL-2010 in Recommendation ITU-T Z.101 and used in Comprehensive SDL-2010 in Recommendation ITU-T Z.102, and the features of Recommendations ITU-T Z.103 and ITU-T Z.104.

- **Recommendation ITU-T Z.161 (revised) "Testing and Test Control Notation version 3: TTCN-3 core language"** 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.

  The core language of TTCN-3 can be expressed in a variety of presentation formats. While this Recommendation defines the core language, Recommendation ITU-T Z.162 defines the tabular format for TTCN (TFT) and Recommendation ITU-T Z.163 defines the graphical format for TTCN (GFT). The specification of these formats is outside the scope of this Recommendation. The core language serves the following three purposes:

  a) as a generalized text-based test language;

  b) as a standardized interchange format of TTCN test suites between TTCN tools;

  c) as the semantic basis (and where relevant, the syntactical basis) for the various presentation formats.

  The core language may be used independently of the presentation formats. However, neither the tabular format nor the graphical format can be used without the core language. Use and implementation of these presentation formats shall be done on the basis of the core language.

  This revision of the Recommendation contains amendments, clarifications, corrigenda and editorial corrections.

- **Recommendation ITU-T Z.161.2 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Configuration and deployment support"** 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.

- **Recommendation ITU-T Z.161.3 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Advanced parameterization"** 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.

- **Recommendation ITU-T Z.161.4 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Behaviour types"** 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.

- **Recommendation ITU-T Z.161.6 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Advanced matching"** 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. TTCN-3 packages are intended to define additional TTCN-3 concepts, which are not mandatory as concepts in the TTCN-3 core language, but which are optional as part of a package which is suited for dedicated applications and/or usages of TTCN-3. While the design of TTCN-3 package has taken into account the consistency of a combined usage of the core language with a number of packages, the concrete usages of and guidelines for this package in combination with other packages is outside the scope of the present document.

- **Recommendation ITU-T Z.161.7 "Testing and Test Control Notation version 3: TTCN-3 Language Extensions: Object-Oriented Features"v** 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.

- **Recommendation ITU-T Z.165.1 (revised) "Testing and Test Control Notation version 3: TTCN-3 language extensions: Extended TRI"** 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.

- **Recommendation ITU-T Z.166 (revised) "Testing and Test Control Notation version 3: TTCN-3 control interface (TCI)"** 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 V4.11.1). 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 V4.11.1 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.

- **Recommendation ITU-T Z.167 (revised) "Testing and Test Control Notation version 3: Using ASN.1 with TTCN-3"** 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.

- **Recommendation ITU-T Z.169 (revised) "Testing and Test Control Notation version 3: Using XML schema with TTCN-3"v** defines the mapping rules for the world wide web consortium (W3C) schema to Testing and Test Control Notation 3 (TTCN-3) to enable testing of XML-based systems, interfaces and protocols.

  This revision of the Recommendation contains amendments, clarifications, corrigenda and editorial corrections.

- SG2 agreed

  - **ITU-T E-Suppl.11 "Criteria for M2M/IoT-Related Assignments under Recommendation ITU-T E.164.1 and Recommendation ITU-T E.212 Annex A"** defines criteria for assigning E.164 Identification codes and E.212 Mobile Network Codes under shared MCCS for M2M/IoT services.

  - **ITU-T E.164 Suppl.2 "Supplement 2 to Recommendation ITU-T E.164: Number portability"** defines standard terminology for a common understanding of the different aspects of number portability within an ITU-T E.164 numbering

scheme. It identifies numbering and addressing formats, call flows, network architectures and routing approaches that will provide alternative methods of implementation. It also proposes some examples of the administrative and operational processes required for the successful implementation of number portability.

- **ITU-T TR.CLE "Technical Report on identify call location for emergency service"** provides an overview of the technical solution of identifying the call location of the emergency service.
- **ITU-T Technical Report PSTR-PXNR "No-reference pixel-based video quality estimation algorithm"** describes the best submission to the P.NATS phase 2 competition for a no-reference pixel-based video quality estimation module, where the winning contributions are intended to be included in the P.1200-series. The ITU-T P.1203-series of Recommendations specifies modules for a set of model algorithms for monitoring the integral media session quality for transport control protocol (TCP) type video streaming. The use case for the module included in this contribution is similar to that of the P.1203.1 modules, estimating the short-term subjective video quality. During the selection process the module presented herein was the best performing in its group (no-reference pixel-based MOS estimators). However, it is not included in the final Recommendation since the performance was lower than what had been a-priori decided by the group as a minimum-performance criterion. The algorithm and resulting performance numbers are instead published as an open ITU-T Technical Report so future modelling work can build on the results from this project. Also, a more appropriate minimum performance criteria can be based on this report, instead of using something more ill-fitting for a purely pixel-based use case, such as encoded bit rate. A Python implementation of the module has been included in an Appendix for reference.

SG9 agreed:

- **ITU-T J.Suppl.10 "Correspondence Between CableLabs DOCSIS Specifications and ITU-T J-series Recommendations"** is to clarify the relationship between the multiple generations of CableLabs DOCSIS specifications and the ITU-T J-series of DOCSIS-based recommendations.
- **ITU-T Technical Paper JSTP-AFDI "Analysis and related solutions for full duplex interference"** describes that several primary interferences will impact the in-band full-duplex CM performance, and the interference mitigation solutions are provided.
- **ITU-T Technical Paper JSTP-IBBDTV "Integrated broadcast-broadband digital TV application cooperated with server for functional extension including functions of digital TV reception and processing"** describes an integrated broadcast-broadband (IBB) digital TV application cooperated with server for functional extension including functions of digital TV reception and processing. In the current CATV systems, services are dependent on functions of a set top box (STB); thus, the services that require functions beyond the capabilities of an STB cannot be introduced. This system allows for the introduction of new services that require furthering the capabilities of the existing STBs and

smoothly transitioning to new STB models. The system is built on an IBB system as defined in [ITU-T J.207]. This system comprises servers and STBs with the following features. The server receives a cable broadcast signal, processes the required content elements and applications, and transfers the processed outputs to STBs. The STB presents the delivered processed outputs, and provides user-interactive functions.

SG11 agreed

- **ITU-T Q.Supplement 72 "Signalling requirements for IMS emergency telecommunications service in support of multiple accesses"** defines the signalling requirements for IMS emergency telecommunications service in support of multiple accesses including fixed broadband, Wi-Fi, 4G and 5G networks.
- **Technical Report ITU-T QTR-RLB-IMEI "Reliability of IMEI" (under publication)** contains a study on the reliability of IMEI, including information about key vulnerabilities to IMEI reprogramming on mobile devices, challenges to make the IMEI non-reprogrammable, effects of IMEI tampering on mobile users, brand owners, manufacturers, service providers, regulators, governments, law enforcement agencies and on national security. It addresses key challenges faced by a range of stakeholders that arise from cloned/tampered IMEIs, including concerns about the misuse of IMEI numbers raised by Member States at ITU Council-17 and ITU Council-18. It also proposes ways to improve IMEI reliability and preventive steps for solving the issues on a national and international level.

SG12 agreed

- **ITU-T P.Suppl.28 "Supplement CDR to ITU-T P-series of Recommendations - Considerations for the development of new QoS and QoE related objective models to be embedded in Recommendations prepared by Study Group 12"** provides guidelines for Recommendations which are to be consented by SG12, when these Recommendations describe or specify tools for the objective estimation of dimensions of QoS and QoE with quality models.
- **ITU-T Y Suppl.60 "Interpreting Y.1540 Maximum IP-Layer Capacity Measurements"** provides information on interpreting Y.1540 Maximum IP-Layer Capacity Measurements, described in Annex A and Annex B. The supplement to provide useful information for those who measure various technologies. Much has been learned as part of the 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 have the most recent version.
- **ITU-T TP GSTP-IPTV-QoS "Technical Paper: Performance metrics for end-to-end IPTV video quality"** describes useful QoS performance metrics for video quality of IPTV service in all domains of IPTV architecture intended to enhance end-to-end video quality and, as a result, improving quality of experience of end-users. Detailed explanation of measurement methodologies of these metrics on each domain from headend to home network is presented.

SG13 agreed

- **ITU-T Y.Suppl.66 "Network 2030 Services: Capabilities, performance and design of new communications services for the Network 2030 applications"** tries to assess the new services and capabilities required by network 2030. This Supplement includes common terminology and definitions necessary for describing new services. It also analyses gaps in existing communication technology to provide the reasoning behind the new communication services that are proposed in this document.
- **ITU-T Y.Suppl.67 "Representative use cases and key network requirements for Network 2030"** presents at first seven representative use cases for Network 2030 with their potential key network requirements: Holographic Type Communications (HTC); Tactile Internet for Remote Operations (TIRO); Intelligent Operation Network (ION); Network and Computing Convergence (NCC); Digital Twin (DT); Space-Terrestrial Integrated Network (STIN); Industrial IoT (IIoT) with cloudification. Then, five overarching abstract requirement dimensions are proposed and scored relatively in order to compare the requirements of each use case, graphically. The rationale for consideration of these abstract dimensions is stated in detail, as well as an analysis of each use case from the abstract dimension perspective.
- **ITU-T Technical report NET2030-DF "Driving Forces and Vision towards Network 2030"** aims to provide a holistic vision for Network 2030, and analyses some fundamental driving forces by presenting four new network capability driven use cases and services. Accordingly, future-oriented challenges with potential network requirements are stated as well. Overall, this report provides an overview of Network 2030, finally leading to the three pillars of Network 2030, in terms of new applications, new services and new infrastructures.
- **ITU-T Technical report "Use of ITU-T Recommendations by Developing Countries" (under publication)**: 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.

SG15 agreed:

- **ITU-T G.Suppl.49 (revised) "Rogue optical network unit (ONU) considerations"** enumerates the various requirements arising from 5G wireless systems, concentrating on the fronthaul portion of the network and considers how they compare with current and future optical access transport systems. Practical passive optical network (PON) solutions to serve the 5G fronthaul application are hypothesized.
- **ITU-T G.sup.58 (revised) "Optical transport network module framer interfaces"** describes several interoperable component to component multilane interfaces (across different vendors) to connect an optical module (with or without digital signal processor (DSP)) to a framer device in a vendor's equipment supporting 25G, 40G, 50G, 100G or beyond 100G optical transport network (OTN) interfaces. Only the structure of the 11G, 28G or 56G physical lanes of the different OTN module framer interface (MFI) examples is provided in this Supplement. For their electrical characteristics, the OIF-CEI IA specifications can be used. This Supplement relates to Recommendation ITU-T G.709/Y.1331.
- **ITU-T G.Sup.68 "Synchronization OAM requirements"** provides an overview of Synchronization operations, administration, maintenance (OAM), includes fault management, performance monitoring, alarms and events.
- **ITU-T G.Suppl.69 "Migration of pre-standard implementations and networks to G.mtn"** describes considerations for migration of networks using pre-standard SPN to using MTN technology.
- **ITU-T G.Supp.70 "Sub 1Gbit/s Services Transport over OTN"** describes existing and an SDH-based method to support the transport of Sub-1G signals through the OTN. A Sub-1G signal is a digital signal whose bit rate is included in a range from nominally 2 Mbit/s to less than nominally 1 Gbit/s.
- **ITU-T L.Sup.39 to ITU-T L.100-series Recommendations "Optical fibre cable Recommendations and standardization guideline"** provides information on the guideline used in the development of optical fibre cable Recommendations. The guideline also helps for readers to understand organization of L.100-series cable Recommendations.
- **ITU-T Technical Paper GSTP-HNIA "Use of G.hn in Industrial Applications"** summarizes a set of use cases for G.hn based PLC in industrial applications. Each use case is discussed by description and requirement for PLC technology. This document intends to provide guidance for G.hn based PLC technology to enter a new area beyond home network.
- **ITU-T Technical paper "On the use of G.hn technology for smart grid" (under publication)** describes the use of G.hn transceivers over power lines infrastructure for different smart grid use cases. The document is intended to provide guidance to silicon vendors, system vendors and electrical utilities to define, configure and deploy devices using G.hn transceivers in this type of environment. This document does not enter into the details of G.hn technologies as they are already described in the relevant Recommendations. The G.hn family of Recommendations includes G.9960 [1], G.9961 [2], G.9962 [3], G.9963 [4] and G.9964 [5] and is referred to herein as G.996x.

- **ITU-T Technical Report LSTR-GLSR (revised) "Guide on the use of ITU-T L-series Recommendations related to optical technologies for outside plant"** contains a functional grouping of the ITU-T Recommendations on:

  - optical cable construction for all kinds of terrestrial application, including marinized terrestrial cables;
  - optical infrastructures, including node elements, installation techniques and network design;
  - outside plant maintenance, operation and support management, including disaster management issues;
  - passive optical components.

  For each Recommendation, there is a short description of the purpose, content and, in many cases, the evolution of the content in the subsequent versions. The main purpose of this guide is to give to developing countries an improved capability in the application of standards, while the telecommunication industry, particularly manufacturers and operators, could benefit from the greater involvement of developing countries in the making and application of standards. The guide could also have a wider use among manufacturers and operators who are not directly involved in the preparation of this group of Recommendations and they could find the guide to be a useful tool both for rapidly focusing on the Recommendation(s) of specific interest and for better understanding the meaning and the objectives of each Recommendation.

- **ITU-T Technical Report GSTR-GNSS "Considerations on the use of GNSS as a primary time reference in telecommunications"** provides information relevant to optimal GNSS reception in telecom applications where highly accurate time recovery is critical. Unlike commonly used GNSS navigation applications, where position is the goal, the focus in telecom is on accurate time recovery with stationary receivers, which provide accurate time to such equipment as primary reference time clocks (PRTCs) and base stations in mobile networks.

SG20 agreed on:

- **ITU-T Y.Suppl.58 "Internet of Things and smart cities and communities standards roadmap":** Supplement 58 to the ITU-T Y-series presents the Joint Coordination Activity on Internet of Things and Smart Cities and Communities (JCA-IoT and SC&C) roadmap, which contains a collection of standards and ITU-T Recommendations related to Internet of things (IoT), smart cities and communities (SC&C), network aspects of identification systems, including RFID (NID) and ubiquitous sensor networks (USNs).

71. Several new Recommendations standardize the network aspects of IMT-2020:

- **Recommendation ITU-T G.8300 "Characteristics of transport networks to support IMT-2020/5G"** defines the requirements for the layer one transport network support for the 5G fronthaul, midhaul and backhaul networks as defined later in this document.
- **Recommendation ITU-T Q.5022 "Signalling procedure of energy efficient device-to-device communication for IMT-2020 network"**: According to different surveys, the

number of wireless devices may reach trillions by 2020. The massive increase of wireless devices will lead to different interconnection and communications challenges. In this regard, most of wireless devices would need to use D2D communication. In general, D2D communication may bring additional benefits to new wireless devices such as higher throughput, better cell coverage, spectrum efficiency and other valuable features of the cellular networks. However, still, there is a need to specify a procedure which may switch between two algorithms used for D2D communication according to the cell status, as follows:

- communication algorithm which is used in a stable condition of the cell;
- communication algorithm which is used in the situation when the serving Base Station (BS) becomes unavailable in certain period of time.

This procedure should be based on an energy efficient intra-cell clustering and the procedure should be able to reuse frequency between clusters. The key advantage of the procedure is the reducing of the signalling overhead.

The Recommendation describes a D2D communication procedure to be used as a part of the IMT-2020 control plane.

- **Recommendation ITU-T Y.3076 "Architecture of ICN-enabled Edge Network in IMT-2020"** specifies the requirements and architecture about ICN-enabled edge network in IMT-2020. 1) From the service and network operation point of view, it discusses detailed requirements of ICN-enabled Edge network in IMT-2020. 2) It provides architecture of ICN-enabled edge network. 3) It describes the key functions and interfaces to satisfy the requirements of ICN-enabled edge network.
- **Recommendation ITU-T Y.3108 "Capability exposure function in the IMT-2020 networks"** specifies design principles, architecture and reference points of the capability exposure function (CEF) in the IMT-2020 networks. Exposed capabilities brought by network softwarization and the architecture of IMT-2020 and functionalities that support the capability exposure of IMT-2020 are specified in the Recommendation."
- **Recommendation ITU-T Y.3109 "QoS requirements and framework for virtual reality delivery using mobile edge computing supported by IMT-2020" (under approval)** specifies Quality of Service (QoS) requirements and a framework for virtual reality delivery using mobile edge computing in IMT-2020. It first provides an introduction on virtual reality delivery using mobile edging computing supported by International Mobile Telecommunications (IMT) 2020 network. It then specifies QoS requirements and a framework. The classification of VR services and the detailed VR service factors that become a basis for identifying requirements are specified in Appendix I and II. The typical VR user cases and guidelines for deployments of VR services are described in Appendix III and VI.
- **Recommendation ITU-T Y.3132 "Mobility management for fixed mobile convergence in IMT-2020 networks"** presents the scenarios, requirements and design principles of mobility management (MM) for fixed mobile convergence (FMC) in IMT-2020 networks, which supports the network evolution and accommodates convergent services in fixed and mobile networks. This Recommendation presents the mobility management functional architecture for supporting FMC in IMT-2020 networks and

information flows of location management, handover control and coordination management in IMT-2020 networks.

- **Recommendation ITU-T Y.3133 "Capability Exposure enhancement for supporting FMC in IMT-2020 networks"** describes the requirements of the capability exposure for supporting FMC in IMT-2020 networks, then defines the functional architecture, the function entities, the procedures and the high level API descriptions for network capabilities exposure for supporting FMC in IMT-2020 networks. In particular, the enhancement capabilities requirements include: unified authentication, authorization and charging, user's access type and capability, multi-access edge computing, unified customization of QoS capabilities, FMC network slice control, session management and mobility management, unified user data.

- **Recommendation TU-T Y.3134 "IMT-2020 fixed mobile convergence functional requirements for management and orchestration"** gives specification about IMT-2020 FMC functional requirements for management and orchestration in order to realize unified network management and resource orchestration functions in IMT-2020 FMC context. The functional requirements include general aspect, resource aspect, service aspect, user aspect and performance aspect of IMT-2020 FMC functional requirements for management and orchestration. The afore-mentioned functional requirements are beneficial to network operators and service providers to design, deploy and operate network in IMT-2020 FMC context.

- **Recommendation ITU-T Y.3136 "Session management for fixed mobile convergence in IMT-2020 networks"** describes the scenarios, general requirements and design principles of session management (SM) for fixed mobile convergence (FMC) in IMT-2020 networks. This Recommendation describes the functional architecture and key functions of session management for supporting FMC in IMT-2020 networks. This Recommendation provides information flows of PDU session management and traffic routing management for FMC in IMT-2020 networks.

- **Recommendation ITU-T Y.3150 (revised) "High-level technical characteristics of network softwarization for IMT-2020"**: With the global recognition of the usefulness of network slicing technology, which is the most typical substantiation of the network softwarization approach, this Recommendation describes how network softwarization and network slicing contribute to IMT-2020 systems. It explores network slicing from two viewpoints: vertical and horizontal aspects. The Recommendation further describes network slicing for mobile fronthaul/backhaul, introduction to advanced data-plane programmability, and capability exposure. These technical characteristic descriptions are expected to lead to their detailed study.

  This revision contains i) the change of a basic model, which contains SDN, NFV, cloud computing and other technical environments, and ii) security consideration for network slicing. In addition, informative information on hierarchical orchestration is included.

- **Recommendation ITU-T Y.3153 "Network slice orchestration and management for providing network services to 3rd party in the IMT-2020 network"**: The IMT-2020 network in which embedded a capability exposure functionality enables 3rd party to directly use a customised network slice under certain a restriction in order to efficiently provide optimized solutions for different market scenarios which have

diverse their own requirements. Automated processes for orchestration and management is also important from the perspective of efficiency. The objective of this Recommendation is to describe the requirements, architecture, key functionalities and typical procedures of network slice orchestration and management for providing network services to 3rd party in the IMT-2020 network.

- **Recommendation ITU-T Y.3154 "Resource pooling for scalable network slice service management and orchestration in the IMT-2020 network"**: Managing the lifecycle of network slices has recently caught much attention as well as constructing end-to-end network slices. Especially, the agility and flexibility in resource allocation to network slices becomes more important for rapid service delivery to network slice service customers in the IMT-2020 network. This Recommendation describes scalable service management and orchestration framework using the middle layer named 'Resource Pool', which intensively stores a variety of virtual resources information collected from the underlying infrastructure layer relevant to network slice instances. Network slice instances can be created from the resources reserved according to network slice service demand forecast. The proposed approach in this Recommendation is generic and thus applicable to wide variety of organizational entities in network slicing such as network infrastructure provider, network slice provider, network slice service provider, and network slice service customer.
- **Recommendation ITU-T Y.3155 "Enhanced SDN Data Plane for IMT-2020"** provides the requirements and high-level architecture of enhanced SDN data plane (ESDP) for IMT-2020 which is aiming to provide improved support for relevant requirements of the network. Based on the high-level architecture, it specifies functional blocks, reference points, and work flow of ESDP.
- **Recommendation ITU-T Y.3156 "Framework of network slicing with AI-assisted analysis in IMT-2020 networks"**: For the future enhanced operation and maintenance management of network slicing with the purpose of satisfying users' service level agreement (SLA) requirements, this Recommendation describes the requirements and functional roles of AI-assisted analysis which supports the lifecycle management and orchestration of network slicing.
- **Recommendation ITU-T Y.3173 "Framework for evaluating intelligence levels of future networks including IMT-2020"** specifies a framework for evaluating the intelligence of future networks including IMT-2020. A method for evaluating the intelligence levels of future networks including IMT-2020 is introduced. An architecture view for evaluating network intelligence levels is also described according to the architectural framework specified in [ITU-T Y.3172]. In addition, the relationship between the framework described in this Recommendation and corresponding work in other standards or industry bodies, as well as the application of the method for evaluating network intelligence levels on several representative use cases are also provided.
- **Recommendation ITU-T Y.3174 "Framework for data handling to enable machine learning in future networks including IMT-2020"**: A framework for data handling to enable machine learning in future networks including IMT-2020 is described in this Recommendation. The requirements for data collection and processing mechanisms in various usage scenarios for machine learning in future networks including IMT-2020

are identified along with the requirements for applying machine learning output in the machine learning underlay network. Based on this, a generic framework for data handling and examples of its realization on specific underlying networks are described.

- **Recommendation ITU-T Y.3175 "Functional architecture of machine learning based quality of service assurance for the IMT-2020 network"** specifies a functional architecture of machine learning based quality of service (QoS) assurance for the international mobile telecommunications 2020 (IMT-2020) network. It first provides an overview of architectural framework for machine learning in IMT-2020 [ITU-T Y.3172]. It then describes the functional architecture of machine learning based QoS assurance for the IMT-2020 network including the reference points. It finally specifies the procedures of machine learning based QoS assurance for the IMT-2020 network.
- **Recommendation ITU-T Y.3176 "Machine learning marketplace integration in future networks including IMT-2020"** provides high-level requirements and the architecture for integrating ML marketplaces in future networks including IMT-2020. Based on these requirements, the architecture for the integration of ML marketplaces is described taking into account the architectural framework in [ITU-T Y.3172] as a basis.
- **ITU-T Y.Suppl.55 to ITU-T Y.3170-series "Machine learning in future networks including IMT-2020: use cases"** describes the use cases of machine learning in future networks including IMT-2020. For each use case description, along with the benefits of the use case, the most relevant possible requirements related to the use case are provided. Classification of the use cases into categories is also provided.
- **ITU-T Y.Suppl.59 to ITU-T Y.3100 of Recommendations "IMT-2020 standardization roadmap"** represents the snapshot of the current status of standardization activities on IMT-2020. It is based on the IMT-2020 standards roadmap, an online project maintained by the JCA-IMT2020 since its establishment.
- **ITU-T Y.Suppl.64 "Awareness on Use Cases and Migration Aspects of IMT-2020":** IMT-2020 is rapidly evolving and for many organizations, including administrations, it is important to have awareness of these new developments. At this stage, it is critical to have awareness on use cases of IMT-2020 and possible migration scenarios from existing networks to IMT-2020. This Supplement to the ITU-T Recommendation series Y.3100 on IMT-2020 has been developed to provide awareness, on use cases and migration aspects of IMT-2020. The supplement was developed by Q5/13 with initial collaboration of Q20/13.

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

- **Recommendation ITU-T F.743.20 "Assessment framework for big data infrastructure" (under approval)** gives an assessment framework of big data infrastructure, which includes functional metrics, performance metrics, scalability metrics, security metrics, operation metrics and compatibility metrics.
- **Recommendation ITU-T Y.3509 "Cloud computing - Functional architecture for data storage federation"** specifies the DSF functions based on DSF logical components identified in [ITU-T Y.3505], the DSF functional architecture and its reference points. This Recommendation also provides relationships between the DSF functional architecture and the cloud computing reference architecture defined in [ITU-T Y.3502].

- **Recommendation ITU-T Y.3524 "Cloud computing maturity requirements and framework"** provides functional framework and requirements for cloud computing maturity. It introduces the overview of cloud computing maturity and identifies the cloud computing maturity model including cloud customer management module, cloud resource management module, cloud service management module and cloud security management module. Additionally, this Recommendation provides cloud computing maturity requirements derived from use cases.
- **Recommendation ITU-T Y.3525 "Cloud computing - Requirements for cloud service development and operation management"** specifies functional requirements of cloud service development and operation management based on the analysis of corresponding use cases.
- **Recommendation ITU-T Y.3530 "Cloud computing - Functional requirements for blockchain as a service"**: Blockchain as a service (BaaS) is a cloud service category in which the capabilities provided to the cloud service customer are the ability of setting up blockchain platform, and development decentralized application using blockchain technologies. In BaaS, an integrated developing environment (IDE) for CSCs is provided to create, deploy and operate decentralized applications. This Recommendation introduces blockchain and blockchain as a service. This Recommendation also provides functional requirements of blockchain as a service which is derived from use cases.
- **Recommendation ITU-T Y.3531 "Cloud computing - Functional requirements for machine learning as a service"** provides cloud computing requirements for machine learning as a service (MLaaS), which addresses requirements from use cases. Machine learning as a service is a cloud service category in which the capability provided to the cloud service customer is the provision and use of machine learning framework. Machine learning framework is a set of functionalities for provisioning machine learning data as well as training, deploying, and managing machine learning model.

  On the perspective of cloud computing service provisioning, this Recommendation provides the functional requirements for MLaaS to identify functionalities such as machine learning data pre-processing, machine learning model training, machine learning model testing, and etc. Also, this Recommendation aligned with the cloud computing reference architecture of [ITU-T Y.3502].
- **Recommendation ITU-T Y.3603 "Big data – Requirements and conceptual model of metadata for data catalogue"** describes general concept of metadata and its utilization in a big data ecosystem. Also, this Recommendation provides requirements and a conceptual model of metadata for data catalogue as well as the XML schema of metadata as an example. This metadata supports finding data easier, and is used for exchange, preservation, integration, and provenance of data in a big data ecosystem.
- **Recommendation ITU-T Y.3604 "Big data – Overview and requirements for data preservation"** provides the overview of big data preservation and its requirements which are derived from the corresponding use cases. It addresses the subjects of overview of big data preservation, functional requirements of big data preservation as well as use cases of big data preservation.

- **Recommendation ITU-T Y.3605 "Big data - Reference architecture"** defines Big Data Reference Architecture (BDRA) that can serve as a fundamental reference point for big data standardization and which provides an overall framework for the basic concepts and principles of big data. The Recommendation provides a description of reference architecture concepts, two distinct viewpoints including user view and functional view, and also cross cutting aspects. Furthermore, the Recommendation addresses layering framework, functional components within framework and detailed functional descriptions for big data.

- **Recommendation ITU-T Y.3652 "Requirements of big data driven networking"**: Big data driven networking (bDDN) is a group of technologies and methods to facilitate network operation, administration, maintenance and optimization etc. based on the big data generated by the network and a series of methods and tools. That is to say, big data generated by the network are used to serve for the network and make the network better. This Recommendation specifies requirements of big data driven networking. This Recommendation studies general requirements for big data driven networking, requirements of big data plane for big data driven networking, requirements of network plane for big data driven networking, requirements of management plane for big data driven networking, interface requirements for big data driven networking.

73. Internet of Things (IoT) standardization progressed and numerous ITU-T Recommendations were published by ITU-T Study Group 20:

- **Recommendation ITU-T Q.3745 "Protocol for time constraint IoT-based applications over SDN"**: Traffic generated by smart devices becomes a significant part of the Internet. Smart devices require mobility and guaranteed quality of services which need to be managed. Potentially, SDN and NFV based technologies (IMT-2020) will be used for managing all types of services and therefore, SDN is to be tasked to manage these kinds of demands as well. A significant number of the available Internet services require the exact value of network parameters such as latency, jitter, RTT and bandwidth. Using SDN capabilities for managing network parameters, will give a possibility to implement new services such as a tactile Internet, augmented reality, e-health applications. In this regard, the protocol is proposed to ensure the transfer of the requested (by IoT server) network performance requirements for IoT applications in SDN and NFV based networks (IMT2020). This protocol is to be used for interconnection between the IoT server and the Orchestrator application layer (Management application).

- **Recommendation ITU-T Y.4208 "IoT requirements for support of edge computing":** Some of the capabilities offered by the IoT, e.g., capabilities for computing, storage and analytics, are evolving in closer proximity to the IoT data sources. This Recommendation provides an overview on related challenges faced by the IoT and describes how the IoT supporting edge computing may address these challenges. From the edge computing deployment perspective, service requirements for support of edge computing capabilities in the IoT are identified as well as related functional requirements. As example, scenarios of edge computing deployment in different application domains, edge computing scenarios for Vehicle-to-Everything and for smart manufacturing are provided in Appendix I.

- **Recommendation ITU-T Y.4209 "Requirements for interoperation of the smart port with the smart city"** provides the requirements for Smart Port interoperation with Smart Cities and other smart elements. Additionally, these requirements are the foundation that enables the provision of enhanced smart services by the Smart Port (which may also benefit Smart Cities), also described in this Recommendation.

- **Recommendation ITU-T Y.4210 "Requirements and use cases for universal communication module of mobile IoT devices":** As an important part of mobile IoT devices, the universal communication module is a key component to achieve economies of scale for mobile IoT devices, accelerate the progress of research and development, and promote the application of new mobile IoT technologies. This Recommendation specifies requirements for universal communication module of mobile IoT devices. Related use cases are provided in Appendix I, universal communication module reference types are described in Appendix II.

- **Recommendation ITU-T Y.4459 "Digital entity architecture for IoT interoperability"** introduces the digital entity architecture and its prospective in addressing interoperability and security among IoT applications. This Recommendation defines an architecture framework for information-oriented services that makes use of existing infrastructures, including the Internet infrastructure, to enhance secure and managed information sharing over a distributed networking environment. It defines an architecture framework for information management based on the use of digital entity, and a common set of secure services that will help the registration, discovery, resolution, and dissemination of such digital entities. The set of services is designed to facilitate sharing across any storage boundaries, any heterogeneous application boundaries, and any organization boundaries.

  Digital entity architecture defines a minimum set of needed architectural components, and services to provide a generic information and service interoperability. It will facilitate the interoperability of identification, description, representation, access, storage and security of IoT devices. This architecture framework encourages a common security and management interface across different IoT applications.

  Under a digital entity architecture, information represented in digital form is structured as digital entity, each of which has an associated unique persistent identifier. However, metadata contained in the digital entities (e.g. location of the object) could be updated without changing its identifier.

  The identifier allows the digital entities to be identified and discovered, regardless where they are located or stored. Digital entities are not confined within any particular application boundary and may be moved from host to host, accessed from application to application, shared from organization to organization, without losing its ownership or management control, in order to enhance interoperability. The digital entity's data model allows ownership and access control information to be defined by data owners independently of any specific applications.

  This Recommendation can be used with different identification and addressing protocols (e.g. IP and/or non IP based networks).

- **Recommendation ITU-T Y.4461 "Framework of open data in smart cities"** defines a framework of open data in smart cities. It clarifies the concept of open data in smart

cities, analyses the benefits of open data in smart cities, identifies the key phases, key roles and activities of open data in smart cities and describes the framework and general requirements of open data in smart cities. The use cases are also provided in an informative appendix.

- **Recommendation ITU-T Y.4462 "Requirements and functional architecture of open IoT identity correlation service":** Open IoT identity correlation service, or open IoT ICS, is a service to map identities among devices, third party services, and transactions. Recommendation ITU-T Y.IoT-ics specifies the reference architecture of open IoT ICS which supports Internet of things (IoT) devices to access multiple third party service providers. This Recommendation clarifies the concept of the open IoT ICS, identifies its basic capabilities, common requirements and also provides the reference architecture and relevant high-level common procedures for open IoT ICS.
- **Recommendation ITU-T Y.4463 "Framework of delegation service for IoT devices"** is a framework of the delegation service for transferring ownership (i.e., access rights to the IoT devices) among authorized IoT devices. This Recommendation describes overview and types of the delegation service in IoT environment. It also describes the requirements and architectural models of the delegation service.
- **Recommendation ITU-T Y.4464 "Framework of blockchain of things as decentralized service platform"** introduces a decentralized IoT service platform, blockchain of things (BoT), which is enabled by blockchain-related technologies. This Recommendation analyses the concept, common characteristics and high-level requirements of BoT, and provides common capabilities and functionalities, general procedures, and relevant use cases for BoT. BoT, works in a decentralized service mode and is capable of enhancing many aspects of IoT. It has the advantages of blockchain-related technologies, especially for building decentralized data storage and management, crowding decision-making and automatic interactions.
- **Recommendation ITU-T Y.4465 "Framework of IoT Services based on Visible Light Communications"** describes a framework of Internet-of-Things (IoT) services based on Visible Light Communications (VLC). After describing the technical overview of VLC and the concepts of IoT services based on VLC, this Recommendation describes requirements and a reference model.
- **Recommendation ITU-T Y.4466 "Framework of smart greenhouse service":** A smart greenhouse service enables precision farming with help of IoT devices (such as sensors and actuators) installed in a smart greenhouse. A smart greenhouse service collects information about both environment and crop-growth status, and then analyses the information to produce an optimal growth model for each crop. With the optimal growth model, a smart greenhouse service can maximize agricultural productivity and improve crop quality. In addition, it can enhance user convenience. To describe a smart greenhouse service framework, this Recommendation specifies requirements, a reference model, a functional architecture and interfaces for a smart greenhouse service.
- **Recommendation ITU-T Y.4467 "Minimum set of data structure for automotive emergency response system":** An automotive emergency response system (AERS) for aftermarket devices defined in the Recommendation ITU-T Y.4119 is designed to bring rapid assistance to driver and/or passengers involved in accidents. For a normal

operation purpose of the AERS, an accident related data (so-called minimum set of data, MSD) needs to be sent from an automotive emergency detection device (AEDD) to an automotive emergency response center (AERC). An MSD includes mandatory information and optional information. Mandatory information of an MSD is a set of information that shall be included in an MSD when an AEDD performs normal operation. Optional information of an MSD is a set of information on an accident that can be additionally included to give more information to AERC. This Recommendation specifies an MSD structure and encoding rule for an AERS.

- **Recommendation ITU-T Y.4468 "Minimum set of data transfer protocol for automotive emergency response system":** An automotive emergency response system (AERS) for aftermarket devices defined in the Recommendation ITU-T Y.4119 is designed to bring rapid assistance to driver and/or passengers involved in accidents. For a normal operation purpose of the AERS, an accident related data (so-called minimum set of data, MSD) needs to be sent from an automotive emergency detection device (AEDD) to an automotive emergency response center (AERC). This Recommendation specifies an MSD transfer protocol to provide the rules of an MSD transfer operations between an AEDD and an AERC in an AERS.

- **Recommendation ITU-T Y.4469 "Reference architecture of spare computational capability exposure of IoT devices for smart home"** introduces spare computational capability exposure (SCCE) of Internet of things (IoT) devices for smart home and provides the characteristics and reference architecture of SCCE. In addition, it provides common procedures and several use cases to illustrate the concepts and the reference architecture of SCCE. SCCE is a functional entity in the smart home that facilitates IoT applications to make full use of spare computational capabilities of IoT devices in smart home scenarios. SCCE collects the spare computational capabilities exposed by IoT devices and provides them to IoT applications. With using SCCE, the spare computational capabilities of IoT devices can be used by IoT applications instead of the cloud to reduce the requirements of cloud computing and network resources.

- **Recommendation ITU-T Y.4470 "Reference architecture of artificial intelligence service exposure for smart sustainable cities"** introduces artificial intelligence service exposure (AISE) for smart sustainable cities (SSC), and provides the common characteristics and high-level requirements, reference architecture and relevant common capabilities of AISE. AISE is one of the basic supporting functional entities for smart sustainable cities, with which SSC services can use uniform reference points (exposed by AISE) to integrate and access the AI capabilities of AI services (e.g., machine learning services for image recognition, natural language processing services, traffic prediction services etc.). In addition, AISE can collect and open SSC data, and it supports AI services to train and perform AI capabilities in AISE in SSCs.

- **Recommendation ITU-T Y.4471 "Functional architecture of network-based driving assistance for autonomous vehicles" (under approval)** defines a reference functional architecture of network-based driving assistance (NDA) for autonomous vehicles. It clarifies the concept of NDA, specifies key functional entities and defines reference points between entities. The use cases and operational procedures are also provided in an informative appendix.

For improvement in the driving of autonomous vehicles, coordination between vehicles and infrastructures need to be improved with network technologies to provide the increasing transportation services and application requirements. NDA can improve the safety and efficiency of automated driving with capabilities of cooperative perception and decisions.

- **Recommendation ITU-T Y.4472 "Open data application programming interface (APIs) for IoT data in smart cities and communities" (under approval):** A growing number of smart cities and Administrations are inclined to collaborate and mutualize their efforts and resources for IoT deployments and open data sharing. This Recommendation intends to study the concept and potential of developing a secured open and interoperable API in the context of IoT deployment and open data management in smart cities. It will analyse current solutions implemented by Administrations around the world, where applicable, including those adopted by smart cities, to share their data through open and interoperable interfaces. It will subsequently specify an open and interoperable API for secured Open Data architecture as well as to support IoT data interoperability for smart cities.

  This Recommendation presents a complete set of Open APIs dedicated to smart cities offering different features covering the needs of interoperable smart city framework development. In order to achieve interoperability among heterogeneous platforms and development of smart cities, the Recommendation proposed "interoperability points" in southbound and northbound in smart city framework. It provides a list of core API sets focusing on data interoperability, including context data management APIs, data transactions APIs, data storage APIs, and security APIs. Through the mechanism of subscriptions, it is possible to get a performant and scalable context data managment. The data storage APIs allow a granular management of the saved data for all cases, in particular both for open data and private data. The data transaction APIs facilitate exposure and access to the data through a data marketplace. In addition, security and privacy APIs are seriously taken into account to provide secure data exchange. It should be noted that data interoperability with open APIs can be completed with using common data models which is briefly discussed. Common data models built upon the collaboration with several standard fora and European projects are opened to public to use of them. The development of interoperable framework makes smart city platforms cost-efficient, flexible and extendable. The interoperability is not a choice but a must in smart city systems that embeds multiple verticals.

- Recommendation ITU-T Y.4473 "SensorThings API – Sensing" specifies the SensorThings application programming interface (API) which provides an open standard-based and geospatial-enabled framework to interconnect Internet of things (IoT) devices, data, and applications over the Web. The SensorThings API is an open standard, and that means it is non-proprietary, platform-independent. It builds on a rich set of proven-working and widely-adopted open standards, such as the Web protocols and the Open Geospatial Consortium (OGC) sensor Web enablement (SWE) standards, including the ISO/OGC observation and measurement data model. The SensorThings API is extensible and can be applied to not only simple but also complex use cases. This Recommendation provides a standard way to manage and retrieve observations and metadata from heterogeneous IoT sensor systems. The

SensorThings API uses representational state transfer (REST) principles, an efficient JavaScript object notation (JSON) encoding, message queuing telemetry transport (MQTT) protocol, flexible OASIS open data protocol (OData) and uniform resource locator (URL) conventions.

- **Recommendation ITU-T Y.4474 "Functional architecture for IoT services based on Visible Light Communications"** describes the functional architecture for Internet of Things (IoT) services based on Visible Light Communications (VLC), which includes functional requirements, functional architecture, messages and information flows.
- **Recommendation ITU-T Y.4475 "Lightweight intelligent software framework for IoT devices"** addresses the concept of the lightweight intelligent software framework (LISF) which supports IoT applications requiring intelligent processing, and enables it working on resource-limited IoT devices. It identifies general requirements and provides a functional architecture of LISF based on the IoT reference model [ITU-T Y.4000].
- **Recommendation ITU-T Y.4556 "Requirements and functional architecture of smart residential community"** presents the key components and specifies requirements and the functional architecture of smart residential community (SRC).
- **Recommendation ITU-T Y.4558 "Requirements and functional architecture of smart fire smoke detection service":** Fire smoke detection service is usually deployed in indoor environment like residential buildings, factories, shopping malls, hotels, office buildings, etc. With the development of society and economy, fire smoke detection service is playing a more and more important role in people's life, but there are some issues, including inefficient maintenance and management, non-real-time device failure detection, non-real-time fire alarms notification and poor service experience.

  In order to solve the above issues, Smart Fire Smoke Detection (SFSD) service can not only detect the smoke concentration through sensors and trigger a fire alarm when it reaches a certain threshold to prevent disaster, but also send the alarm information to the cloud platform through network, thus relevant departments and personnel can be notified in time through Web/APP/SMS/Voice/Instant Message Client, etc. The SFSD service can provide many benefits, including efficient maintenance and management, real-time alarm report, real-time faults report and good service experience. Based on these observations, this Recommendation describes requirements and functional architecture of SFSD service.
- **Recommendation ITU-T Y.4559 "Requirements and functional architecture of base station inspection services using unmanned aerial vehicles" (under approval)**: The changes being experienced in weather conditions and the aging of materials may cause damage to base stations, which will affect network service quality and even cause safety incidents. Network operators need to carry out timely and periodic inspection and maintenance operations. Due to the long-term, high-intensity and high-altitude nature of these operations, the base station inspection (BSI) services conducted manually are dangerous, inefficient and costly.

  Unmanned aerial vehicles (UAVs) with mature flight control and sensing capabilities can be used not only in the normal working environment but also in some extreme working environments. Therefore, BSI using UAVs can replace most manual

inspections through a network connection and reduce the risk of inspection and ensure the safety of personnel. To achieve automation functions, the UAV needs to bear corresponding flight control, sensing and capturing, and communication capabilities, and it is necessary to develop a BSI supporting platform with corresponding functions to fulfil the automation and safety requirements of BSI services using UAVs.

This Recommendation describes requirements and functional architecture of BSI services using UAVs. It focuses on how to effectively provide inspection services for the base station using BSI-dedicated UAVs (BSI-UAVs).

- **Recommendation ITU-T Y.4560 "Blockchain-based data exchange and sharing for supporting Internet of things and smart cities and communities":** Blockchain is an emerging technology, its most important characteristics are traceable, un-erasable, immutable, and time-stamped. It is able to efficiently ensure integrity, authenticity, and auditability for all transactions. Blockchain has important impacts and benefits for data exchange and sharing in support of Internet of things (IoT) and smart cities and communities (SC&C). In most of the IoT and SC&C scenarios, it is necessary to ensure data processing, circulation, sharing and management for all trust operations. Blockchain technologies can meet these needs. This Recommendation specifies the requirements, functional models, a platform and deployment modes of blockchain-based data exchange and sharing for supporting IoT and SC&C.
- **Recommendation ITU-T Y.4561 "Blockchain-based Data Management for supporting Internet of things and smart cities and communities":** Along with the development of the Internet of things (IoT) and smart cities and communities (SC&C), various applications have different kinds of requirements for data management, and there are many challenges, especially in data representing, data processing, data service provisioning, and other aspects in a secure and effective manner. Meanwhile, blockchain as an emerging technology possesses the characteristics of trust, transparency, traceability and accountability. It has the potential capabilities to solve the existing issues in data management. This Recommendation specifies the requirements, generic reference model, common capabilities and procedures of blockchain-based data management.
- **Recommendation ITU-T Y.4808 "Digital entity architecture framework to combat counterfeiting in IoT":** This Recommendation is intended to provide a solution framework employing digital entity architecture to combat the use of counterfeit Internet of things (IoT) devices worldwide.
- **Recommendation ITU-T Y.4903/L.1603 (revised) "Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals" (under approval)** gives general guidance to cities and provides key performance indicators (KPIs) for smart sustainable cities (SSCs) to help cities achieve sustainable development goals (SDGs). This document provides the most effective 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 key 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.

- **Recommendation ITU-T Y.4904 "Smart sustainable cities maturity model"** contains a maturity model for smart sustainable cities. This maturity model helps identify the goals, levels and key measures that are recommended for cities to effectively examine their current situation and determine critical capabilities needed to progress toward the long-term goal of becoming SSCs.
- **Recommendation ITU-T Y.4907 "Reference architecture of blockchain-based unified KPI data management for smart sustainable cities"** provides a reference architecture for blockchain-based unified KPI (key performance indicator) data management for smart sustainable cities (BKDMS). This Recommendation provides the concept, characteristics and high-level requirements of BKDMS. A reference architecture including capabilities of its functional entities is described in details, and unified structures of KPI data are also introduced with which to ensure BKDMS realizable.
- **ITU-T Y.Suppl.56 "Use cases of smart cities and communities"** provides a set of use cases related to Smart Cities and Communities (SC&C). The SC&C use cases described in this Supplement are in pilot or commercial phase. The use case collection is expected to provide useful information for the definition of common requirements of SC&C and for other future studies on SC&C. It is also expected this information will benefit the study of the relationship between city scales and SC&C solutions, and will provide examples of the social and economic benefits. The use cases in this Supplement may also help to plan the deployment of similar smart city solutions in other cities.
- **ITU-T Y.Suppl.57 to ITU-T Y.4409 "Implementation Guidelines to Recommendation ITU-T Y.4409"** provides the implementation guidelines to [ITU-T Y.4409]. This Supplement describes implementation based on the functional architecture for the home energy management system (HEMS) and home network services specified in [ITU-T Y.4409] with regards to the information models for the devices connected to the home network, the communications protocols and the management for the home network. This Supplement also describes implementation of connecting devices with corresponding information models.
- **ITU-T Y.Suppl.58 "Internet of Things and smart cities and communities standards roadmap"** presents the Joint Coordination Activity on Internet of Things and Smart Cities and Communities (JCA-IoT and SC&C) roadmap which contains a collection of standards and ITU-T Recommendations related to Internet of Things (IoT), smart cities and communities (SC&C), network aspects of identification systems, including RFID (NID) and ubiquitous sensor networks (USN).
- **ITU-T Y.Suppl.61 "Features of application programming interface (APIs) for IoT data in smart cities and communities":** A growing number of smart cities and administrations are inclined to collaborate and mutualize their efforts and resources for Internet of things (IoT) deployments and open data sharing. This Supplement 61 to ITU-T Y-series Recommendations studies the concept and potential of developing secured open and interoperable application programming interfaces (APIs) in the context of IoT deployment and open data management in smart cities. Supplement 61 to ITU-T Y-series Recommendations analyses current solutions implemented by

administrations around the world, where applicable, including those adopted by smart cities, to share their data through open and interoperable interfaces. Supplement 61 to ITU-T Y-series Recommendations subsequently specifies open and interoperable APIs for secured open data architecture and to support IoT data interoperability for smart cities. Supplement 61 to ITU-T Y-series Recommendations concludes by mapping the specified APIs with relevant work performed by other international standards development organizations (SDOs) and alliances, to help consolidate the standards developed on the topic.

- **ITU-T Y.Suppl.62 "Overview of blockchain for supporting Internet of things and smart cities and communities in data processing and management aspects"** provides an overview of blockchain aspects related to data processing and management (DPM) for the Internet of things (IoT) and smart cities and communities (SC&C). There are many benefits and challenges to addressing blockchain, IoT and sustainable SC&C together. Blockchain presents opportunities for disruptive innovations, which enables global businesses to conduct transactions with less friction and more trust and efficiency. Blockchain shows great promise across a wide range of business applications in many fields, including IoT and SC&C.
- **ITU-T Y.Suppl.63 "Unlocking Internet of things with artificial intelligence"** examines how artificial intelligence could step in to bolster the intent of urban stakeholders to deploy Internet of things (IoT) technologies and eventually transition to smart cities.

74. ITU-T Study Group 20 adopted the IoT specifications from OneM2M and published them as Recommendations. Currently ITU-T SG20 is working on draft Recommendation ITU-T Y.oneM2M.SEC.SOL "oneM2M Security Solutions".

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. The FIGI Security, Infrastructure and Trust Working Group led by ITU developed an additional four reports in 2020. The FIGI Symposium which was planned in June 2020 was moved to June 2021 due to the COVID-19 pandemic.

    The FIGI Security Clinic in Geneva, 4-5 December 2019, presented the latest findings of the ITU-led FIGI Working Group on "Security, Infrastructure and Trust". In focus were new FIGI reports on topics including the mitigation of security vulnerabilities in Signalling System 7, digital identity and strong authentication, and security assurance frameworks to increase security across the value chain. The Financial Inclusion Global Initiative (FIGI) – designed to advance research in digital finance and accelerate digital financial inclusion in developing countries – is led by ITU, the World Bank Group and the Committee on Payments and Market Infrastructures, with support from the Bill & Melinda Gates Foundation.

    The new Digital Currency Global Initiative is a collaboration between ITU and Stanford University established in July 2020. The Initiative will continue the dialogue and research initiated by the ITU-T Focus Group on Digital Currency including Digital Fiat Currency 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.

76. 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 100 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. U4SSC is also developing a 'Global Smart Sustainable City Index' derived from these KPIs. New U4SSC reports include "A Guide to Circular Cities" and eight associated case studies and "Blockchain for smart sustainable cities", as well as a range of city snapshots, factsheets and verification reports sharing the results of the latest KPI evaluations.

    The U4SSC implementation programme is supporting cities' pursuit of the SDGs by working together with national administrations and city leaders to building a comprehensive approach to smart city development, looking at both KPI evaluations and wider national contexts for planning and action.

    U4SSC is developing expert guidance on topics including:
    – Practitioner guides for the measuring and monitoring of smart city progress.
    – ICT-based smart city platforms support the digital transformation of public services and their integrated management.
    – Cities' resilience in the face of emergencies such as COVID-19 and routes to economic and financial recovery.
    – Public procurement in the digital age to support city leaders in establishing effective processes for the procurement of ICT solutions for smart cities.
    – Tools and mechanisms to finance smart city projects, benefiting from the contributions of a wide variety of smart city stakeholders in the public and private sectors.
    – The implementation of AI solutions efficiently and sustainably in cities.
    – Low-cost solutions not reliant on extensive infrastructure or highly skilled labour, an area of U4SSC work particularly relevant to small and medium-sized cities and cities in developing countries.

77. The ITU/WMO/UNESCO-IOC Joint Task Force on SMART[2] Cable Systems is leading an ambitious new 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.

78. ITU-T 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.

[2] Science Monitoring and Reliable Telecommunications

❖ ITU Journal

November 2019 saw the publication of a new special issue of the ITU Journal on "Propagation modelling for advanced future radio systems – Challenges for a congested radio spectrum", published together with the bureau responsible for radio communications (BR). The original research explores the impact of radio wave propagation on the efficient use of radiofrequency spectrum and the planning of radio systems and networks.

A new special issue of the ITU Journal "The future of video and immersive media" was published in June 2020, highlighting the advancements in multimedia as well as the work of ITU in relation to video innovation including video compression algorithm standards.

The ITU Journal began a new chapter in the publication of academic research, with the launch of the ITU Journal on Future and Evolving Technologies (ITU J-FET). This publication welcomes papers addressing 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 J-FET will release its first publication in November 2020 as well as the calls for papers of its upcoming special issues on:

- Internet of Bio-NanoThings for health applications
- Internet of Everything
- Terahertz communications
- Wireless communication systems in beyond 5G era

The ITU Journal is available to the public on the ITU website and is free of charge for both readers and authors.

The joint publication between ITU and Tsinghua University Press, Intelligent and Converged Networks, published its first issue in June 2020 which is available currently 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 11th edition of Kaleidoscope, Kaleidoscope 2019: "ICT for Health: Networks, standards and innovation", organized by ITU in collaboration with WHO, was held in Atlanta, U.S., 4-6 December 2019, hosted by ITU Academia member the Georgia Institute of Technology. IEEE, IEEE ComSoc and The Lancet Digital Health were technical co-sponsors of Kaleidoscope 2019. Presented papers are compiled into the conference proceedings, freely available for download from the ITU website. These papers are also published in the IEEE *Xplore* Digital Library and the IEEE Communications Standards Magazine.

The 12th edition of the conference, Kaleidoscope 2020: "Industry-driven digital transformation", will be held as a fully online conference from 7-11 December 2020. This

conference will focus on the innovations contributing to digital transformation in the industry sector and the effect of new technologies on the automotive, energy, retail and healthcare industries and the role that standards play. This edition of the conference is technically co-sponsored by the IEEE, IEEE ComSoc and supported by the IEEE Technology and Engineering Management Society (IEEE TEMS). The Programme is available online, as well as the registration for the conference (including Guidelines), and information on how to join remotely.

79. Resolution 177 on Conformance and Interoperability (Dubai, 2018) endorsed the objectives of both Resolution 76 (Rev. Hammamet, 2016) and Resolution 47 (Rev. Dubai, 2014) on conformity and interoperability of ICT equipment. The goal of Resolution 76 (Rev. Hammamet) on Conformance and Interoperability testing is to help in increasing probability of interoperability and to ensure all the countries to benefit of ICTs. WTDC-14 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:

- **Recommendation ITU-T Q.3963 "The compatibility testing of SDN-based equipment using OpenFlow protocol"**: One of the challenges in the area of software-defined networking is to ensure the compatibility of solutions from various producers at all layers of the NFV and SDN network. There are many SDN solutions, both open-source and proprietary; each is unique in terms of the software implementation by the object, which, even if it delivers the functionality required by the standard, is still at risk in certain cases of the network failing or holding up traffic owing to a loss of the OpenFlow connection between the SDN switch and controller of the programmable network, exposing the operator (network owner) to the risk of financial and other losses (e.g. of customers). To prevent such situations, when installing equipment on a telecommunication network, the operator will test the equipment in question for compatibility with other devices already operating on the network. In the case of SDN, tests are required to check the compatibility of OpenFlow protocol modules of each version installed on the device being tested.

  This Recommendation has been developed with a view to harmonizing existing practices in the area of compatibility testing of devices using the OpenFlow operating system.

- **Recommendation ITU-T Q.4062 "Framework for IoT Testing"**: The IoT is one of the global infrastructures for the information society, delivering advanced services by interconnecting things based on, existing and evolving, interoperable information and communication technologies. Such a global infrastructure can be achieved by use of multiple access technologies for different types of communication networks such as BAN, PAN, LAN, WLAN, LPWAN, FAN, MAN, WAN and Cellular networks. Conformance and interoperability tests not only for domains with single access technology but also for the integrated domains with multiple access technologies are required. The main goal of this Recommendation is to specify the testing framework for IoT to accommodate the tests for such integrated domains with multiple access technologies. Conformance and interoperability tests for domains served by single

unified access technology have been taken into account by relevant SDOs and therefore are out of scope of this Recommendation. This Recommendation describes the types of the tests for the domains with multiple access technologies and specifies the test procedures and the considerations correspond to the testing types.

- **Recommendation ITU-T Q.4063 "The framework of testing of identification systems used in IoT"**: The concept of the Internet of Things, defined in Recommendation ITU-T Y.4000/Y.2060, nowadays plays an important role for telecommunication and information technologies. According to a forecast, the number of Internet of Things in the foreseeable future will be hundreds of billions pieces, and further it will grow up to trillions. It is essential that most of customers of telecommunication networks will be IoT-based devices in the near future. In other words, all objects which are surround us might become IoT. The IoT, in accordance with the Recommendation ITU-T Y.4050/Y.2069, are things which have a network address and have the ability to integrate it. The penetration of IoT devices is going very fast and therefore, requires the standardization of identification procedures and relevant testing methods.

  Also, bearing in mind that there are a lot of applications of Internet of Things, the testing of their identity might be considered as a very important issue as it allows customer to ensure the authenticity of the IoT. The classification of IoT, in terms of testing of their identification systems and the relevant testing approaches are subjects of this Recommendation.

- **ITU-T Q.Suppl.71 "Testing methodologies of Internet related performance measurements including e2e bit rate within the fixed and mobile operator's networks"** describes the testing procedures of data transmission speed within the fixed and mobile operator's networks which can be established at the national or international level, providing customers of the existing public telecom networks the possibility to estimate the access related performance. The proposed methodology is based on the concept of the ITU-T Q.3960 "Framework of Internet related performance measurements" (2016).

- **ITU-T Technical Paper QSTP-TEST-UE-MS "Guideline for general test procedure and specification for measurements of the LTE, 3G/2G user Equipment/mobile stations (UE/MS) for over-the-air performance testing"**, which gives an analysis of the work in relevant standardisation organisations (SDOs) and a survey of the requirements, and then describes a common testing methodology for LTE, 3G/2G User Equipment/Mobile Stations (UE/MS) for over-the air (OTA) performance testing.

80. 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. Two new ITU-T Guidelines "Testing Laboratories Recognition Procedure" and "ITU-T CASC procedure to appoint ITU-T technical experts" were approved in 2015 and 2017 respectively. Currently, ITU-T CASC is in the process of developing a third guideline, the "ITU-T CASC collaboration procedure with IECEE for TL recognition service on ITU-T Recommendations", with an anticipated agreement date of October 2019.

ITU-T Guideline on "ITU-T CASC procedure to appoint ITU-T technical experts" (revised) describes the procedures to appoint an ITU-T technical expert to be involved in the TL

assessment teams of existing conformity assessment programmes (e.g. ILAC, IECEE, etc.), for assessing /checking the competence of Testing Laboratories which requested such recognition against one or a set of ITU-T Recommendation(s).

81. In March 2019, ITU-T CASC started the process of appointing ITU-T technical experts following procedures defined in the relevant guideline. Following the review of applications, appointments will be announced at the next meeting of ITU-T CASC. ITU-T CASC continues its collaboration with existing conformity assessment Systems and schemes such as IEC and ILAC. The Certification Management Committee (CMC) of IEC has established an IECEE Task Force on "ITU requirements" which finalized the draft Operational Document (OD) "ICT Laboratory recognition Service on ITU-T Recommendations". The OD is expected to become a dedicated testing laboratory recognition procedure, established by IECEE following the anticipated approval of the OD by IECEE in 2019. This decision will enable all testing laboratories to apply for such recognition following the instructions provided by the OD.

82. At the same time, ITU-T CASC, in collaboration with IECEE, is developing a joint ITU/IEC certification scheme. ITU-T CASC established a list of ITU-T Recommendations that may be addressed by joint ITU/IEC certification schemes with input received from ITU members. Among them are Recommendations ITU-T P.1140, ITU-T P.1100, ITU-T P.1110 and ITU-T K.116.

    1) 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).

    2) 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 Conformance Testing 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 regions.

    3) ITU 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.

4) 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.

83. 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.

84. 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).

85. 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.

86. 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.

87. 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).

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

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

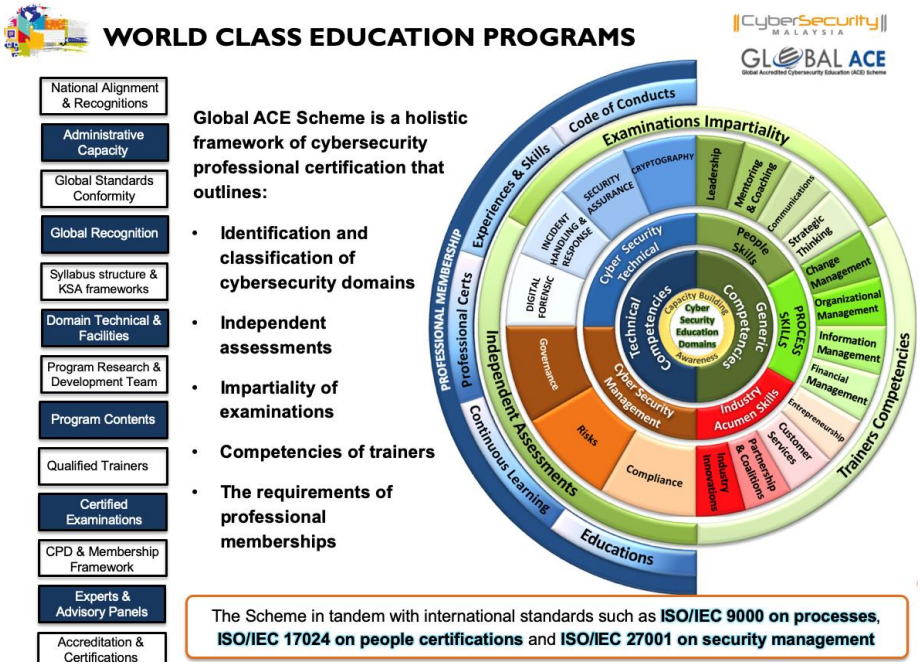
Related to SDGs: SDG 1 (1.4), SDG 4 (4.1, 4.3, 4.5), SDGs 5 (5.b), SDGs 7 (7.1, 7.a, 7.b), SDG 8 (8.1), SDGs 9 (9.1, 9.c),

89. 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.

90. The 15th Action Line C5 facilitator's meeting was held on Friday, 31 July 2020. The theme of this year was **"Cybersecurity in the era of Quantum Information Technology (QIT): challenges and considerations for ICT networks."** The session provided an overview of the evolution of Quantum information technology (QIT) globally while examining the challenges encountered in its development, in particular the security challenges and considerations for its compatibility and interoperability with classical ICT networks. The session also aimed to provide insight on the potential impact on security that QIT will have on classical ICT networks.

91. As the main outcome of this session, it was agreed that cybersecurity is a critical issue to be addressed during the development of QIT, and governments and policymakers need to foster ICT ecosystems that facilitate multi-stakeholder collaboration for investing in and driving innovation towards "future-secure" technologies, focusing on aspects such as quantum cryptography for QIT. Standardization can play an important role in promoting the proliferation of QIT, charting a course for seamless interoperability and bridging the digital divide.. More details about the meeting are available here.

92. The WSIS Prizes 2020 Winner for the Action Line C5 is Global Accredited Cybersecurity Education Scheme: Centre of Excellence for Capacity Building and Lifelong Learning, CyberSecurity, Malaysia.



The Global ACE Scheme defines the holistic competencies expected of skilled personnel in the cybersecurity area. It describes the knowledge, skills and attitudes needed to perform in a particular occupation with emphasis on enhancing related skillsets. The Scheme is developed in tandem with ISO/IEC17024, ISO/IEC27001 and ISO/IEC9000 standards.

Global ACE Scheme CoE is a primary deliverable under the Global ACE Scheme project. It establishes a single converging platform for cybersecurity capacity building and lifelong learning within the region that allows individuals to develop capabilities at their own pace and permit continual enhancement through the lifelong learning pathways. The Global ACE Scheme CoE empowers professionals to share knowledge, expertise and skillsets, instil the ability to continually identify up-to-date cyber threats and mitigation methods. The Global ACE Scheme CoE infuses cybersecurity capabilities from members of participating countries, engaging them and stimulate shareable cognitive actions. Objectives are to support the continuous development of individuals in mitigating cyber-related threats, build effective cyber defenders within their social-economic sphere and establish inclusive and equitable quality programs for all.

In Malaysia, the Scheme is utilised to certify cybersecurity professionals at the national level. Personnel certified by the Scheme is recognised by MBOT through the Malaysia ACT 768 as a Professional Technologist or Certified Technician that carries the prefix of Ts. or Tc. before their name. The Department of Skills Malaysia through the Malaysia Act 652 has incorporated the Scheme's syllabuses for the NOSS development. About 60% of public universities have started aligning cybersecurity academic modules with the Scheme to incorporate professional credentials. Internationally, 13 countries have shown interest in the project. They are Azerbaijan, Oman, Indonesia, Iran, Brunei, Nigeria, Egypt, UAE, Kazakhstan, Bangladesh, Pakistan, Sudan and Turkmenistan.

Project website

https://www.cybereducationscheme.org

Sustainable development goals related to this project

- Goal 4: Quality education
- Goal 10: Reduced inequalities

Target beneficiary group(s)

- Youth
- Older persons
- Women
- Indigenous and nomadic peoples
- People with disabilities
- The unemployed
- The poor

- Migrants
- Remote and rural communities

93. 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))

94. 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.

95. In the area of legal measures, ITU collaborates closely with partners such as UNODC and others that may have expertise in this area.

(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))

96. 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 Next Generation Networks (NGN). 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.

97. ITU-T Study Group 17 (SG17) is the lead study group on security and identity management with its role being reinforced by WTSA-16 Res. 50 and 52. SG17 is also working on the implementation of WTSA-12 Res. 58 to "Encourage the creation of national Computer Incident Response Teams, particularly for developing countries" and is following Resolution 130 of the Plenipotentiary Conference (Rev. Dubai, 2018). Study Group 17 has continued its responsibility for building confidence and security in the use of information and communication technologies (ICTs) and continues to be instrumental in study and standardization in the areas of cybersecurity, anti-spam, IdM, ITU-T X.509 certificates, information security management, ubiquitous sensors networks, telebiometrics, mobile security, virtualization security towards cloud computing security, personally identifiable information protection and security architecture and application security, often in

cooperation with external Standards Developing Organizations and Consortia.intelligent transport system security, cybersecurity, countering Instant Messaging Spam, identity management, X.509 certificates, information security management, telebiometrics. SG17 approved the following Recommendations:

- **Recommendation ITU-T X.500 (revised) "Edition 9 of Rec. ITU-T X.500 | ISO/IEC 9594-1 Information technology - Open Systems Interconnection - The Directory: Overview of concepts, models and services"** introduces the concepts of the Directory and the DIB (Directory Information Base) and overviews the services and capabilities which they provide.
- **Recommendation ITU-T X.501 (revised) "Edition 9 of Rec. ITU-T X.501 | ISO/IEC 9594-2 Information technology - Open Systems Interconnection - The Directory: Models"** provides a number of different models for the Directory as a framework for the other Recommendations in the ITU-T X.500-series.
- **Recommendation ITU-T X.509 (revised) "Edition 9 of Rec. ITU-T X.509 | ISO/IEC 9594-8 Information technology - Open Systems Interconnection - The Directory: Public-key and attribute certificate frameworks"** defines frameworks for public-key infrastructure (PKI) and privilege management infrastructure (PMI).
- **Recommendation ITU-T X.510 | ISO/IEC 9594-11 (revised) "Information technology – Open Systems Interconnection – The Directory: Protocol specifications for secure operations"** specifies a general protocol, called the wrapper protocol, that provides cyber security for protocols designed for protection by the wrapper protocol. Recommendation ITU-T X.510 | ISO/IEC 9594-11 contains recommendations for how other Recommendations and International Standards may include features for migration of cryptographic algorithms, and it includes ASN.1 specifications to be applied for that purpose.
- **Recommendation ITU-T X.511 (revised) "Edition 9 of Rec. ITU-T X.511 | ISO/IEC 9594-3 Information technology - Open Systems Interconnection - The Directory: Abstract service definition"** defines in an abstract way the externally visible services provided by the Directory, including bind and unbind operations, read operations, search operations, modify operations, operations to support password policies and operations to support interworking with LDAP. It also defines errors.
- **Recommendation ITU-T X.518 (revised) "Edition 9 of Rec. ITU-T X.518 | ISO/IEC 9594-4 Information technology - Open Systems Interconnection - The Directory: Procedures for distributed operation"** specifies the procedures required for a distributed directory consisting of a mix of Directory System Agents (DSAs) and lightweight directory access protocol (LDAP) servers acting together to provide a consistent service to its users, independent of the point of access.
- **Recommendation ITU-T X.519 (revised) "Edition 9 of Rec. ITU-T X.519 | ISO/IEC 9594-5 Information technology - Open Systems Interconnection - The Directory: Protocol specifications"** specifies the Directory Access Protocol, the Directory System Protocol, the Directory Information Shadowing Protocol and the Directory Operational Binding Management Protocol which fulfil the abstract services specified in Recommendation ITU-T X.501 | ISO/IEC 9594-2, Recommendation ITU-T X.511 |

ISO/IEC 9594-3, Recommendation ITU-T X.518 | ISO/IEC 9594-4 and Recommendation ITU-T X.525 | ISO/IEC 9594-9.

- **Recommendation ITU-T X.520 (revised) "Edition 9 of Rec. ITU-T X.520 | ISO/IEC 9594-6 Information technology - Open Systems Interconnection - The Directory: Selected attribute types"** defines a number of attribute types and matching rules which may be found useful across a range of applications of the Directory.
- **Recommendation ITU-T X.521 (revised) "Edition 9 of Rec. ITU-T X.521 | ISO/IEC 9594-7 Information technology - Open Systems Interconnection - The Directory: Selected object classes"** defines a number of selected object classes and name forms which may be found useful across a range of applications of the Directory.
- **Recommendation ITU-T X.525 (revised) "Edition 9 of Rec. ITU-T X.525 | ISO/IEC 9594-9 Information technology - Open Systems Interconnection - The Directory: Replication"** specifies a shadow service which Directory system agents (DSAs) may use to replicate Directory information.
- **Recommendation ITU-T X.677 "Identification mechanism for unmanned aerial vehicles using object identifiers" (under approval)** analyses requirements for full life-cycle management and operating identity recognition of unmanned aerial vehicles (UAVs) with security considerations and specifies an identification mechanism for UAVs using object identifiers (OIDs), including detailed specifications of assignment rules and registration procedures of OIDs used for UAVs.
- **Recommendation ITU-T X.1044 "Security requirements of network virtualization"** analyses security challenges and threats to network virtualization (NV), and specifies security requirements for the physical resources layer, virtual resources layer and logically isolated network partition (LINP) layer in NV.
- **Recommendation ITU-T X.1045 "Security service chain architecture for networks and applications"** supports provision of customized dynamic and adaptive security services for networks and applications.
- **Recommendation ITU-T X.1046 "Guideline on software-defined security in SDN (Software-defined Networking)/NFV (Network Function Virtualization) network" (under approval)** specifies a framework of software-defined security – in software defined networks (SDN) and the network functions virtualization (NFV) network.
- **Recommendation ITU-T X.1052 (revised) "Organization information security management guideline"** provides best practices for information security management for telecommunication organizations to support Recommendation ITU-T X.1051.
- **Recommendation ITU-T X.1054 (revised) "Information security, cybersecurity and privacy protection - Governance of information security" :** Governance of information security is the use of resources to ensure effective implementation of information security, and provides assurance that:
  - directives concerning information security will be followed; and
  - the governing body will receive reliable and relevant reporting about information security related activities.

Managers and others working in organizations need to understand:

- the governance requirements that affect their work; and
- how to meet governance requirements that require them to take action.

❖ **Recommendation ITU-T X.1059 "Implementation guidance for telecommunications organizations on risk management of their assets globally accessible in IP-based networks"** provides guidance for telecommunications organizations on risk management of their assets globally accessible in IP-based networks, the assets of which are exposed directly to hackers and attackers.

❖ **Recommendation ITU-T X.1148 "Framework of de-identification process for telecommunication service providers"**: This Recommendation describes a framework of de-identification process with operational steps and specifies data release models and data stages in a de-identification process for telecommunication service providers based on data lifecycle model and roles of stakeholders.

❖ **Recommendation ITU-T X.1149 "Security framework of open platform for FinTech services"** describes an open platform architecture for financial technology (FinTech) services. It also specifies threats and vulnerabilities of open platform, open API usage procedure for FinTech services, and detailed security requirements to open platform of FinTech services from both financial company and FinTech company sides.

❖ **Recommendtion ITU-T X.1216 "Requirements for collection and preservation of cybersecurity incident evidence"** describes a general procedure for cybersecurity incident response and investigation, analyses sources of cybersecurity incident evidence and specifies capability requirements for tools used for collection and preservation of such evidence an investigative process.

❖ **Recommendation ITU-T X.1217 "Framework and guidelines for applying threat intelligence in telecom network operation" (under approval):** This Recommendation specifies guidelines for applying threat intelligence in telecommunication network operation after an overview analysis.

❖ **Recommendation ITU-T X.1218 "Requirements and guidelines for dynamic malware analysis in a sandbox environment":** The purpose of this Recommendation is to analyze threats related to unknown malwares, and put forward the specific requirements of detecting the unknown malwares based on dynamic behavior analysis.

❖ **Recommendation ITU-T X.1232 "Technical framework for countering advertising spam in user generated information"** analyses scenarios and characteristics of advertising spam, and specifies a reference framework and process flows to help Internet service providers to counter advertising spam. It specifies a framework for reducing advertising spam, improving the user experience.

❖ **Recommendation ITU-T X.1254 (revised) "Entity authentication assurance framework"** defines three entity authentication assurance levels (i.e., AAL1 – AAL3), and the criteria and threats for each of the three levels of entity authentication assurance.

❖ **Recommendation ITU-T X.1279 "Framework of enhanced authentication using telebiometrics with anti-spoofing detection mechanisms"** This Recommendation

analyses threats to traditional telebiometric authentication solutions and specifies an architectural framework, authentication process flows and security considerations for enhanced authentication using telebiometrics with anti-spoofing detection mechanisms.

- **Recommendation ITU-T X.1332 "Security guidelines for smart metering service in smart grids"**: This Recommendation provides security guidelines for smart metering services to enable service providers to implement appropriate security measures to ensure security of their service.
- **Recommendation ITU-T X.1363 "Technical framework of personally identifiable information (PII) handling system in Internet of things (IoT) environment":** specifies a technical framework for PII handling in IoT environment with single or multiple service providers.
- **Recommendation ITU-T X.1364 "Security requirements and framework for narrow band Internet of things"**: aims to analyse potential deployment scheme and typical application scenarios of NB-IoT. It specifies security threats and requirements specific to the NB-IoT deployments and thus establishes a security framework for the operator to safeguard these new technology applications.
- **Recommendation ITU-T X.1365 "Security methodology for the use of identity-based cryptography in support of Internet of things services over telecommunication networks"** provides a security methodology for the use of identity-based cryptography public key technology in support of IoT services over telecommunications networks including mechanisms of identity management, key management architecture, key management operations and authentication.
- **Recommendation ITU-T X.1366 "Aggregate message authentication schemes for Internet of things (IoT)"**: This Recommendation specifies two message authentication schemes. One is an aggregate message authentication (AMA) scheme for IoT as a basic mechanism. The other is an interactive aggregate message authentication (IAMA) scheme with interactive protocol in a lightweight and secure manner. Both aggregate message authentication schemes can be applied for ensuring "entity (identity) authentication" as well as for ensuring "message authentication".
- **Recommendation ITU-T X.1367 "Standard format for Internet of things error logs for security incident operations"**: Recommendation X.1367 specifies a standardized error log format that can be placed in a protocol payload, such as syslog [b-IETF RFC 5424] to be used for converting an error log information issued by an edge device to the standard error log format. Recommendation X.1367 also specifies a standardized error code table to solve the second issue.
- **Recommendation ITU-T X.1368 "Secure software update procedure for IoT devices" (under approval):** This Recommendation specifies: 1) basic models and procedures for securely updating firmware/software (FW/SW) of Internet of things (IoT) devices; and 2) requirements and capabilities for updating IoT FW.
- **Recommendation ITU-T X.1371 "Security threats to connected vehicles"** describes security threats to connected vehicles. These threats can be referred to and utilized in other Recommendations developed by ITU-T to consistently develop

Recommendations in the context of the security aspects of intelligent transport systems (ITSs).

- **Recommendation ITU-T X.1372 "Security guidelines for Vehicle-to-Everything (V2X) communication systems"** identifies threats in V2X communication environments and specifies security requirements for V2X communication to mitigate these threats. This Recommendation also provides description of possible implementation of V2X communication with security.
- **Recommendation ITU-T X.1374 "Security requirements for external device with vehicle access capability"** This Recommendation provides security requirements for such external interfaces and external devices with vehicle access capability in telecommunication network environments to address identified threats depending on types of access interfaces.
- **Recommendation ITU-T X.1375 "Methodologies for intrusion detection system on in-vehicle system"** This Recommendation mainly focuses on how to detect intrusion and malicious activities on in-vehicle networks such as those using controller area network (CAN) that cannot be supported by general IDSs currently used in Internet deployments..
- **Recommendation ITU-T X.1376 "Security-related misbehaviour detection mechanism for connected vehicles" (under approval):** Recommendation X.1376 describes a security-related misbehaviour detection mechanism for connected vehicles to help stakeholders to utilize automotive data to improve vehicle security.
- **Recommendation ITU-T X.1400 "Terms and definitions for distributed ledger technology"** contains a baseline set of terms and definitions for distributed ledger technology (DLT). The definitions provide a basic characterization of the term, and where appropriate, a note is included to provide additional clarity.
- **Recommendation ITU-T X.1401 "Security threats of distributed ledger technology":** Recommendation ITU-T X.1401 provides a structured and systematic threat analysis method to design, implement, operate a distributed ledger system and to evaluate its security.
- **Recommendation ITU-T X.1402 "Security framework for distributed ledger technology"**: Based on analysis of security threats and security requirements to DLT, Recommendation ITU-T X.1402 describes security capabilities that could mitigate the related security threats and specifies a security framework methodology to determine how to use these security capabilities to mitigate security threats for a specific DLT system.
- **Recommendation ITU-T X.1403 "Security guidelines for using DLT for decentralized identity management"**: Distributed Ledger Technology and its specific implementations such as Blockchain offer a unique opportunity for utilizing a trust infrastructure and a platform that could be useful in enabling trusted federation for exchanging identity attributes and identity information. This Recommendation provides a telecom-specific privacy and security considerations for using DLT data in identity management.

- **Recommendation ITU-T X.1404 "Security assurance for distributed ledger technology":** This Recommendation defines three levels of security assurance for the distributed ledger technology. It also defines security assurance components and criteria for each of three levels of security assurance for each security assurance components. It also provides a mapping between specific threats and security assurance components and a mapping between specific capabilities and security assurance components.
- **Recommendation ITU-T X.1451 "Risk identification to optimize authentication"** specifies a risk identification function in an ICT service system as a pre-processor before the authentication function is invoked. It enables the ICT service system to optimize user authentication based on identified risks.
- **Recommendation ITU-T X.1452 "Technical framework for security services provided by operators":** This Recommendation aims to classify the potential use cases of the security service provided by operators, analyze the specific requirements for the security service and thus provides the guidelines for the operator to safeguard and improve the security service.
- **Recommendation ITU-T X.1604 "Security requirements of network as a service (NaaS) in cloud computing"** analyses security threats and challenges on network as a service (NaaS) in cloud computing and specifies security requirements of NaaS in NaaS application, NaaS platform and NaaS connectivity aspects based on corresponding cloud capability types.
- **Recommendation ITU-T X.1605 "Security requirements of public infrastructure as a service (IaaS) in cloud computing":** This Recommendation aims to document security requirements of public IaaS in order to help IaaS providers to improve security of IaaS platform throughout the planning, building and operating stages.
- **Recommendation ITU-T X.1606 "Security requirements for communications as a service application environments"** This Recommendation describes scenarios and features of CaaS containing multi-communication capabilities. Then it identifies specific threats arising from unique CaaS features and recommends appropriate CaaS security requirements.
- **Recommendation ITU-T X.1702 "Quantum noise random number generator architecture"** This Recommendation is an add-on to existing noise or entropy source standards that allow specification of whether the noise source under evaluation is based on quantum physics or not.
- **Recommendation ITU-T X.1710 "Security framework for quantum key distribution networks"** specifies a framework for quantum key distribution networks (QKDNs) including requirements and measures to combat security threats. This Recommendation specifies a simplified QKDN structure and the relevant security threats. Security requirements and corresponding security measures are then specified on that basis.
- **Recommendation ITU-T X.1714 "Key combination and confidential key supply for quantum key distribution networks"** aims to specify the security requirements for both the key combination and the key supply from the QKDN to cryptographic applications.

- **Recommendation ITU-T X.1750 "Guidelines on security of big data as a service for Big Data Service Providers"**: Recommendation X.GSBDaaS analyses security challenges BDaaS faces, identifies security roles and responsibilities for provision of BDaaS, as well as a security framework for a big data infrastructure. It also specifies security protection measures that should be satisfied for services and components related to BDaaS.
- **Recommendation ITU-T X.1751 "Security guidelines on big data lifecycle management for telecommunication operators"** This Recommendation introduces specific characteristics of telecommunication big data services and data categories, analyses security vulnerabilities of big data lifecycle management, specifies security guidelines for telecommunication operators.
- **Recommendation ITU-T X.1811 "Security guidelines for applying quantum-safe algorithms in 5G systems" (under approval)** identifies threats raised by quantum computing to fifth generation (5G) systems through assessing the security strength of currently used cryptographic algorithms.

SG17 also agreed on the following Technical Reports

- **ITU-T Technical Report "Security framework for quantum key distribution in telecom network":** This Technical Report studies the perspective of Quantum key distribution (QKD). Although QKD technologies have been developed for several decades, there is a need to develop a QKD framework to satisfy requirements from the telecom network's perspective.
- **ITU-T Technical Report XSTP "Problems, requirements and potential solutions for OID resolution"** identifies problems, requirements and potential solutions for OID resolution. The problems include local performance and global resolution of missing OID subtrees. Technical requirements for possible solutions are also discussed. Finally, potential technical solutions, administrative and operational guidance are provided.
- **ITU-T Technical Report "Security in telecommunications and information technology (7th edition)"** provides a broad introduction to the Information and Communication Technology (ICT) security work of the ITU-T and, more specifically, it summarizes how the ITU-T is responding to global cybersecurity challenges with Recommendations, technical reports, guidance documents and outreach initiatives.
- **ITU-T Technical Report "Successful use of security standards (2nd edition)"** presents examples of how ITU-T Recommendations are used today in the market place to help protect networks, people, data and critical infrastructure.
- **ITU-T Technical Report "Description of the incubation mechanism and ways to improve it"**

  This technical paper's purpose is to answer the question of how to bring innovation in cybersecurity standardization in Study Group 17 in a timely manner. As any mechanism can be improved it will as well review and analyse what other SDOs are doing to bring innovation and perhaps it will help SG17 to constantly review and improve this mechanism.
- **ITU-T Technical Report "Strategic approaches to the transformation of security studies"** is the synthesis of all the results delivered by the correspondence group on

transformation of security studies under the mandate of ITU-T SG17 from August 2017 to August 2020. It includes the contextualization of this work and the methodological aspects considered. It describes the strategic thinking that the correspondence group developed. It covers the short, mid and long-term aspects of the transformation of security studies.

- **ITU-T Technical Report "Unified Security Model (USM) - a neutral integrated system approach to Cybersecurity":** The Unified Security Model and architecture presented here is a universal "all matters security" architecture, that is neutral and agnostic. It has the potential to facilitate security control mass interoperability and security response automation.

98. ITU-T Study Group 3 continues to work on a policy framework and principles for data protection in the context of big data relating to international telecommunication services.

99. ITU-T Study Group 13 approved the following recommendations:

- **Recommendation ITU-T Y.3055 "Framework for Trust based Personal Data Management"**: This Recommendation provides a framework architecture specifying related functional blocks and reference points with relevant information flows. Details of prospective technologies for personal data management and a trust evaluation model with a specific use case are described in informative appendices.
- **Recommendation ITU-T Q.3057 "Signalling requirements and architecture for interconnection between trustable network entities"** specifies the signalling architecture and requirement for interconnection between trustable network entities in support of existing and emerging networks. Based on the architecture, it specifies the interfaces and signalling requirements between the functional entities and signalling procedures to be applied.
- **Recommendation ITU-T Y.3800 "Overview on networks supporting quantum key distribution"** This Recommendation aims to provide support for design, deployment, operation and maintenance to implement QKD networks (QKDNs) in terms of standardized technologies. The relevant network aspects for conceptual structure, layered model and basic functions are within the scope of the Recommendation to support its implementation.
- **Recommendation ITU-T Y.3801 "Functional requirements for quantum key distribution networks"** specifies functional requirements for quantum layer, key management layer, QKDN control layer and QKDN management layer for quantum key distribution networks (QKDN).
- **Recommendation ITU-T Y.3802 "Quantum key distribution networks - Functional architecture" (under approval)** defines a functional architecture model of quantum key distribution (QKD) networks. In order to realize this model, it specifies detailed functional elements and reference points, architectural configurations and basic operational procedures of QKD networks (QKDN).
- **Recommendation ITU-T Y.3803 "Quantum key distribution networks – Key management" (under approval)**: The objective of this Recommendation is to provide the help for design, deployment, and operation of key management of QKDN. Overall structure and basic functions of QKDN are first reviewed along with Recommendation

ITU-T Y.3800, requirements of QKDN are second reviewed along with Recommendation ITU-T Y.3801, and then functional elements and procedures of key management are described in this Recommendation.

- **Recommendation ITU-T Y.3804 "Quantum Key Distribution Networks - Control and Management"**: To realize secure, stable, efficient, and robust operations of and services by a quantum key distribution (QKD) network as well as to manage a QKD network (QKDN) as a whole and support user network management, this Recommendation specifies functions and procedures for QKDN control and management based on the requirements specified in Recommendation ITU-T Y.3801.

100. ITU-T Study Group 9 (SG9) approved the following recommendations:

- **Recommendation ITU-T J.1012 "Embedded common interface for exchangeable CA/DRM solutions; CA/DRM container, loader, interfaces, revocation"** is part of a multi-part deliverable covering the conditional access/digital rights management (CA/DRM) container, loader, interfaces, revocation for the embedded common interface for exchangeable CA/DRM solutions specification. This ITU-T Recommendation is a transposition of the ETSI standard [b- ETSI GS ECI 001-3] and is a result of a collaboration between ITU-T SG9 and ETSI ISG ECI. Modifications have been introduced to clauses 2, 7.7.2.5.2, 9.4.4.6.2, 9.4.6.1, 9.5.2.2, 9.8.1, 9.8.2, 10.2, I-2 and to the Bibliography. Some additional editorial corrections were necessary.

- **Recommendation ITU-T J.1013 "Embedded Common Interface (ECI) for exchangeable CA/DRM solutions; The Virtual Machine"** is part of a multi-part deliverable covering the virtual machine for the embedded common interface (ECI) for exchangeable conditional access/digital rights management (CA/DRM) solutions specification. This ITU-T Recommendation is a transposition of the ETSI standard [b-ETSI GS ECI 001-4] and is a result of a collaboration between ITU-T SG9 and ETSI ISG ECI. A minor modification was done in clause 7.3.7.1.

- **Recommendation ITU-T J.1014 "Embedded common interface for exchangeable CA/DRM solutions; Advanced Security - ECI-specific functionalities"** is one part of a multi-part deliverable covering the ECI-specific functionalities of an advanced security system for the embedded common interface (ECI) for exchangeable conditional access/digital rights management (CA/DRM) solutions specification. This ITU-T Recommendation is a transposition of the ETSI standard [b- ETSI GS ECI 001-5-1] and is a result of a collaboration between ITU-T SG9 and ETSI ISG ECI. Modifications have been introduced to clauses 1, 3.2, 6.1, 6.2, 6.3 and 8.2.3 as well as editorial corrections and the substitution of the term "content processing system" by "Secure Video Path".

- **Recommendation ITU-T J.1015 "Embedded common interface for exchangeable CA/DRM solutions: The advanced security system – Key ladder block"** is part of a series covering the advanced security system key ladder block for the embedded common interface for exchangeable conditional access/digital rights management (CA/DRM) solutions specification. This ITU-T Recommendation is a transposition of the ETSI standard [b-ETSI GS ECI 001-5-2] and is a result of a collaboration between ITU-T SG9 and ETSI ISG ECI.

- **Recommendation ITU-T J.1015.1 "Embedded common interface for exchangeable CA/DRM solutions: The advanced security system – Key ladder block:**

Authentication of control word-usage rules information and associated data" is part of a series covering the advanced security system key ladder block for the embedded common interface for exchangeable conditional access/digital rights management (CA/DRM) solutions specification.

- Recommendation ITU-T J.1031 "Downloadable Conditional Access System for Bidirectional Network; Requirements" specifies requirements for the two-way downloadable conditional access system (DCAS) for bidirectional network.
- Recommendation ITU-T J.1032 "Downloadable Conditional Access System for Bidirectional Network; System Architecture" specifies a system architecture for the two-way downloadable conditional access system (DCAS) for bidirectional network.
- Recommendation ITU-T J.1033 "Downloadable Conditional Access System for Bidirectional Network; The Terminal" specifies a terminal for the two-way downloadable conditional access system (DCAS) for bidirectional network.
- Recommendation ITU-T J.1204 "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.

SG9 also agreed on the following:

- ITU-T J.Suppl.7 "Embedded Common Interface (ECI) for exchangeable CA/DRM solutions; Guidelines for the implementation of ECI (EG)" serves as a guidance document, which contains performance parameters and values as well as use cases for the Embedded Common Interface (ECI) for exchangeable CA/DRM solutions and complements ECI-related ITU-T Recommendations covering the ECI Ecosystem. This ITU-T Supplement is a transposition of the ETSI Group Report [b-ETSI GR ECI 004] and is a result of a collaboration between ITU-T SG9 and ETSI ISG ECI. A minor amendment was introduced with new clause 6.4.
- ITU-T J.Suppl.8 "Embedded Common Interface (ECI) for exchangeable CA/DRM solutions; Trust Environment (TE)" addresses details of a Trust Environment for the Embedded Common Interface (ECI) for exchangeable CA/DRM solutions and complements ECI-related ITU-T Recommendations covering the ECI Ecosystem. This ITU-T Supplement is a transposition of the ETSI standard [b- ETSI GS ECI 001-6] and is a result of a collaboration between ITU-T SG9 and ETSI ISG ECI.
- ITU-T J.Suppl.9 "Embedded Common Interface (ECI) for exchangeable CA/DRM solutions; System Validation (VAL)" addresses scenarios for System Validation for the Embedded Common Interface (ECI) for exchangeable CA/DRM solutions and complements ECI-related ITU-T Recommendations covering the ECI Ecosystem. This ITU-T Supplement is a transposition of the ETSI standard [b- ETSI GS ECI 002] and is a result of a collaboration between ITU-T SG9 and ETSI ISG ECI.

101. ITU-T Study Group 11 agreed ITU-T Technical Report QSTR-SS7-DFS "SS7 vulnerabilities and mitigation measures for digital financial services transactions", which contains a result of the Financial Inclusion Global Initiative (FIGI) Security Infrastructure workstream research into SS7 vulnerabilities and their effect on Digital Financial Services (DFS) in the

developing world. This technical report is the baseline for a SG11 work items on improving the security posture of SS7 towards financial services and other public interest OTT services offered over the telecom infrastructure.

102. ITU-T Study Group 20 is the lead Study Group for IoT identification and within Q6/20 on "Security, privacy, trust and identification for IoT and SC&C" developed:

- **Recommendation ITU-T Y.4459 "Digital entity architecture framework for IoT interoperability"** This Recommendation defines an architecture framework for information-oriented services that makes use of existing infrastructures, including the Internet infrastructure, to enhance secure and managed information sharing over a distributed networking environment.
- **Recommendation ITU-T Y.4807 "Agility by design for Telecommunications/ICT Systems Security used in the Internet of Things"** addresses possible improvement of security and stability of the Internet of Things by ensuring the supporting Telecommunications/ICT systems and related infrastructure — protocols, standards, etc. — have the flexibility to keep up with advances in Telecommunications/ICT security and cryptography.
- **Recommendation ITU-T Y.4808 "Digital entity architecture framework to combat counterfeiting in IoT"** provides information on architecture framework, which encourages a common security and management interface across different IoT applications. Digital entity architecture provides additional means of security (e.g. public key infrastructure) features to authenticate the parties involved in the identifiers registration process.

103. 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). Futuristic mobile technologies foresee "IMT for 2020 and beyond", please read more here: https://www.itu.int/en/ITU-R/study-groups/rsg5/rwp5d/imt-2020/Pages/default.aspx.

(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))

104. ITU continues to help build capacity at regional and international levels. ITU has undertaken technical assessments to evaluate the preparedness for the establishment of Computer Incident Response Teams (CIRTs) in 76 countries and is continuing with the necessary follow-up actions. National CIRTs were established and/or improved in 14 countries and 6 CIRT related projects are currently ongoing. ITU is also actively engaged in the FIRST community (the Forum for Incident Response and Security Teams) and contributes to the work required to improve the CSIRT Service Framework. ITU also supports and contributes to the revision of existing training materials that are part of a capacity-building program to establish and manage national CIRT operations.

105. ITU partnered with the Global Cyber Security Capacity Centre at the Oxford Martin School, and jointly performed Cybersecurity Capacity Reviews in Thailand, Sierra Leone, and

Madagascar. Following a project funded by the Australian Government (DOCA), in 2019, ITU has executed CIRT assessments in Samoa and Tonga, Vanuatu and Papua New Guinea, which were followed by Cybersecurity Capacity Reviews.

106. ITU continues to conduct Cyber Drills for its partner countries. So far, ITU has conducted 29 international/national/regional Cyber Drills involving more than 100 countries. In the past year, international Cyber Drills were held on **a)** 27-31 May 2019 in Bucharest, Romania for the Europe region, **b)** 23-27 September 2019 in Kuala Lumpur, Malaysia for Asia-Pacific region, **c)** 27-31 October 2019 in Muscat, Oman for the Arab region, and **d)** 18-22 November 2019 in Kampala, Uganda for the Africa region. Cyber Drills for 2020 are currently being conducted and include the following events:

- **15 September 2020:** Americas Regional Dialogue
- **16 September 2020:** Asia and the Pacific Regional Dialogue
- **17 September 2020:** Europe Regional Dialogue
- **22 September 2020:** Arab Region Regional Dialogue
- **23 September 2020:** Africa Regional Dialogue
- **24 September 2020:** CIS Regional Dialogue
- **6 October 2020, Webinar:** Empowering Women in Cybersecurity
- **8 October 2020, Webinar:** Cyber Crisis Management Planning: How to reduce Cyber Risk and increase national Cyber Resilience
- **13 October 2020, Training:** How to conduct effective Open Source Investigations Online
- **15 October 2020, Training:** Incident Response with TheHive and Cortex
- **19 October 2020, Webinar:** National Cybersecurity Strategies – Implementation and Monitoring
- **20 October 2020, Training:** Communication in Crisis Management
- **27-29 October and 3-5 November 2020, Exercises:** Scenarios based Exercises
- **19 November 2020, Training:** Practical Cyberthreats Intelligence and Information Sharing using MISP
- **17 November 2020, Training:** Cyberthreats and Social Media
- **22 October 2020, Training:** Industrial cybersecurity and incident response
- **24 November 2020, Webinar:** National CIRT, Measuring and Improving Maturity

107. The Guide to Developing a National Cybersecurity Strategy (NCS Guide), that has been developed and launched during ITU Telecom World in September 2018, is now being deployed in several Member States and regions. Regional workshops were held on 26-28 June 2019 in Skopje, Republic of North Macedonia for the Balkan States and more workshops are planned on 24-29 August 2019 in Jakarta, Indonesia for the Asia-Pacific region. National deployments are being carried out in Benin, Bahamas, Botswana, and Malta. The process to update the exisiting guide is also under way and several coordination meetings took place in October-November 2020.

108. In April 2019, within the framework of the ITU European Regional Initiative on Enhancing Trust and Confidence in the use of ICTs, an event on safe internet day was organized in Albania where ITU provided strategic points of view taking into account ongoing discussions on CIRT implementation in Albania.

109. A National CIRT planning and implementation for Vanuatu workshop, organized in collaboration with the Global Centre for Cybersecurity Capacity Building, was held on 18-22 March 2019 at Port Vila, Vanuatu to assist in (a) the execution of CIRT design activity and (b) reaching agreement on a roadmap for implementation. A national cybersecurity assessment was conducted using the Cybersecurity Capability Maturity Model (CMM).

110. ITU participated in the Vienna Cybersecurity Week from 11-15 March 2019 in Vienna, Austria, with ITU represented in several relevant sessions focusing on cybersecurity in order to present ITU's work and activities. ITU also moderated some sessions, and presented the ITU Regional initiative for Europe on cybersecurity.

111. From 27-31 May 2019, ITU organized a cybersecurity week and cyberdrill with the Government of Romania in Bucharest to help countries identify their capacity in cybersecurity and coordinate the execution of cyberdrills for countries from the Europe region in order to improve effectiveness of CIRTS.

112. In June 2019, ITU, in collaboration with DCAF, organized a Regional Workshop for Europe on "National Cybersecurity Strategies for Western Balkan Economies". The Workshop took place in Skopje, Republic of North Macedonia, from 26-28 June 2019. The aim of the event was to deliver training on National Cybersecurity Strategies and perform hands-on exercises designed to assist participating countries on how to improve their strategies.

113. A coordination meeting was hosted by the World Bank in Washington from 11-16 April 2019 for the Mission Billion Challenge. ITU was invited as the judge for the ID4D Mission Billion Challenge and also to present progress related to the National Cybersecurity Strategy initiative. The meeting also highlighted the steps that ITU is undertaking to carry out deployment of the NCS Gulde at the regional and national level within Member States.

114. Under the framework of the ITU European Regional Initiative on Enhancing Trust and Confidence in the use of ICTs, ITU moderated a conference on cybersecurity on 5-6 June 2019 in the Republic of North Macedonia, with an aim to present ITU's cybersecurity activities and, in particular, to elaborate upon the ITU regional initiatives for Europe on cybersecurity.

115. The Liberia CIRT readiness assessment workshop was organized from 16 to 19 July 2019, Monrovia, Liberia to provide training on National CIRTs, execute a CIRT readiness assessment exercise, elaborate an implementation plan for the country, run interviews, and gather the information required to perform the above objectives.

116. The Burundi CIRT project kick-off meeting was organized from 25 to 27 February 2019, Bujumbura, Burundi to present and recall the results of the CIRT assessment and Burundi CIRT milestones, undertake a series of interactive sessions and discussions with the relevant stakeholders to collect inputs for Burundi CIRT design.

117. Chad CIRT readiness assessment workshop took place from 6 to 8 August 2019, Ndjamena, Chad. The purpose of the workshop was among others, to provide training on National CIRT, execute a CIRT readiness assessment exercise, elaborate an implementation plan for the country, run interviews, and gather the information to perform the above objective.

118. Another cybersecurity workshop In the framework of BDT's concentrated assistance to LDCs was held from 29 October- November 2019 in Banjul, Gambia. The objective was to provide training on National CIRTs, execute a CIRT readiness assessment exercise and elaborate an implementation plan for the country.

(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))

119. ITU 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.

120. In February 2019, ITU participated in the Cyber Defence summit that was held in Riyadh, Saudi Arabia to share information about ITU's activities with other partcipants and also to continue discussions with the Government of Saudi Arabia on the subject.

121. A three-day workshop to advise the INTERPOL General Secretariat on policy formulation and project implementation regarding programmes and operations related to cybersecurity was held on 24-26 April in Lyon, France. The meeting brought together representatives from law enforcement, private sector, academia and international organizations across the world to enhance cooperation on cybercrime.

122. A workshop organized by ITU, in consultation with Deloitte, was held in Ivory Coast from the 29 July–2 August 2019. The aim of the workshop was "information gathering" to improve cybersecurity in Ivory Coast. The collaboration will focus mainly on drafting a proposal with a blueprint and inputs to the National Cybersecurity Strategy (NCS).

123. Within the framework of GCA, the ITU in collaboration with the Global Forum on Cyber Expertise (GFCE) will participate in a thematic workshop on national strategies and CIRTs from 8-10 October 2019, in Addis Ababa, Ethiopia to present ITU's activities on the NCS Guide and the CIRTs initiatives.

124. ITU continues to organize, co-organize, and participate in various human capacity-building forums and meetings as described below. Extensive information can be found in BDT's quarterly and annual performance reports, available at <https://www.itu.int/en/ITU-D/Pages/OperationalPlansPerformanceReports.aspx>.

125. Sub- regional training on the role of information and communication technologies (ICTs) in the context of regional and international security was held on the 23-24 May 2019 in Sarajevo, Bosnia upon invitation by OSCE to showcase ITU activities on cybersecurity and to advance collaboration on the National Cybersecurity Strategy initiative. This meeting also accelerated the handing over of the revised CIRT assessment report to Bosnia and facilitated discussions on the follow-up funding for CIRT implementation of Bosnia.

126. The first mission to provide assistance to Benin on NCS was undertaken on 11-15 March 2019 at Cotonou, Benin. The ITU NCS guidelines were presented, relevant CEOs were met to define the vision, objectives and areas of development of the NCS, inputs were collected in order to elaborate the NSC and a series of interactive sessions and discussions were held with the relevant stakeholders.

127. A workshop to validate Benin National cybersecurity Strategy and its implementation plan has been conducted on 3-5 July 2019 at Cotonou, Benin.

128. A regional capacity building workshop on National Cybersecurity Strategy was held from 26 to 30 August 2019 in Jakarta, Indonesia. The aim of the event was to deliver training on National Cybersecurity Strategies and perform hands-on exercises designed to assist participating countries on how to improve their own strategy.

129. As a follow up of the National Cybersecurity Strategy initiative, ITU conducted a webinar: "National Cybersecurity Strategies – Implementation and Monitoring" on 19 October 2020 to discuss the lifecycle development and implementation of a National Cybersecurity Strategy. Cybersecurity experts with different backgrounds and from different sectors shared their experiences and knowledge on the importance of national cybersecurity strategy related actions to build greater cybersecurity resilience and readiness. Additionally, they also elaborated the approaches and opportunities for better collaboration among different national and international stakeholders. Further building on continued international cooperation and knowledge sharing in the cybersecurity domain is especially important in the current COVID-19 crisis.

130. An event "National Cybersecurity strategy for Fiji" is planned to be implemented in November-December 2020.

131. The following workshops on cybersecurity-related issues are being organized by ITU Academy for Americas Region:

- 19 – 23 August 2019, ITU Academy: Data protection and cryptography.
- 23 September – 23 October 2019, ITU Academy: Online training on Basic concepts of Cybersecurity.
- 14 October – 17 November, ITU Academy: Cybersecurity management based on the standard ISO/IEC 27032.
- 02 – 30 March 2020, ITU Academy: Online training on Cybersecurity basics.
- 05 – 30 October 2020, ITU Academy: Online training on Digital Forensics.

132. Capacity building on national strategies and CGI is currently being undertaken in Vietnam.

133. To address cybersecurity challenges during the COVID-19 pandemic, ITU, together with BitSight, provided access to the BitSight security platform for the ITU Member States. The platform enables ITU Member States to identify ongoing malicious activities against health services and other COVID-19 responding sectors. It offers near real-time data and analytics, covering 23 cybersecurity threat vectors related to COVID-19 related services. BitSight is offering platform access, temporarily free of charge, to all eligible ITU Member States.

134. Training courses in cybersecurity are being identified, and discussions have been initiated with a view to providing courses through the ITU Academy. To facilitate regional training in cybersecurity, the ITU Centre of Excellence Global network has endorsed five training institutions; namely two in the Africa region, one in Asia-Pacific and two in Europe. These

institutions have been conducting training in Cybersecurity as part of their regional training plans under the Centres of Excellence initiative.

135. The cybersecurity needs of least developed countries (LDCs) are the focus of particular attention under ITU's "Enhancing Cybersecurity in Least Developed Countries" project. This project focuses on assisting the LDCs to enhance their capabilities, capacity, readiness, skills and knowledge in the area of cybersecurity. Apart from human capacity building, the project is also geared towards providing the appropriate enabling technologies and related tools to assist LDCs in carrying out activities with regard to securing their cyberspace.

136. To date, the project has been implemented in Sierra Leone, Republic of Guinea, Djibouti, Comoros and Vanuatu, and is at different stages of implementation in Afghanistan, Angola, Bhutan, Burundi, Chad, Haiti, Kiribati, Lao, Mauritania, Myanmar, Rwanda, Tanzania, Uganda and Zambia. Given the strong interest of Gambia in enhancing its cybersecurity capabilities, the project in Gambia has been augmented to a national CIRT establishment.

137. A workshop to provide assistance to Cote d'Ivoire on drafting its National Cybersecurity Strategy was organized by ITU in consultation with Deloitte from 29 July-2 August 2019. The aim of the workshop was "information gathering" to improve cybersecurity in Cote d'Ivoire. The collaboration will focus mainly on drafting a proposal on the blueprint and providing assistance to the Ministry of Communications, Digital Economy and the Post of Cote d'Ivoire with inputs to the National Cybersecurity Strategy.

138. In ITU-D Study Group 2, the renewed Question 3/2: Securing information and communication networks: Best practices for developing a culture of cybersecurity in the 2018-2021 study period will work towards producing reports and guidelines on emerging cybersecurity issues as well as sharing material to be used in training and capacity building activities.

139. Capacity Building also implies having factual information about the state of cybersecurity readiness at a national and international level.

140. Following the announcement of the results of the previous version and its inclusion in Resolution 130 (Rev. Dubai 2018), ITU conducted all necessary tasks to launch the fourth iteration of the Global Cybersecurity Index (GCI) in October 2019 during the Study Group 2 Question 3 meeting. The fourth iteration of GCI adds value to existing cybersecurity indices by capturing current cybersecurity commitments and further expanding multi-stakeholder partnerships.

141. The countries' GCI submissions are in progress, and the deadline for the process was 30 September 2020. The BDT Cybersecurity Team is working on data collection. It will include the questionnaire responses for non-responding countries to cover all the ITU Member States and finally analyze the data to be used in the final report.

142. In addition to experts from academia and the private sector, all Member States were invited to appoint experts to join and contribute to the GCI Weightage Expert Group meeting held on 15 October 2020. The experts will recommend weights based on the relative importance of cybersecurity measures within the GCI model.

143. ITU-T SG17 in its March 2017 meeting supported the proposal to create a Regional Group for Arab Region (SG17RG-ARB). The third meeting of SG17RG-ARB meeting was held in Tunis on 2 - 3 April 2019, jointly with SG17RG-AFR.

(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))

144. The GCA is based on international cooperation and strives to engage all relevant stakeholders in a concerted effort to build confidence and security in the use of ICTs. Following the instructions of the 2019 session of Council, the Secretary-General has submitted for the next physical session session of Council (1) a report explaining how the ITU is currently utilizing the GCA framework and (2) with the involvement of Member States, appropriate guidelines developed for utilization of the GCA by the ITU for Council's consideration and approval. As per the process set out by Council 2019 for developing the draft Guidelines, a virtual open consultation was held for all WSIS stakeholders on 23 April 2020 to provide comments on the draft Guidelines (Open Consultation). Over 160 participants attended the meeting and provided feedback section by section on the draft Guidelines.

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

146. ITU is also currently working on an upcoming collaboration with CERT regional groups namely AfricaCERT, APCERT and OIC CERT. These collaboration will synergise ITU's activities in the regions and will enhance CERT specific knowledge exchanges between regions.

147. ITU 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.

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

148. 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.

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

150. A multi-stakeholder expert working group, consisting of more than 50 organizations and individual experts, started the review of the Child Online Protection Guidelines, which were first issued in 2009. The new set of Guidelines have been issued in 2020.

151. In Africa, discussions started with Chad, Kenya, Malawi, and Rwanda on the implementation of national strategy frameworks. In particular, the COP Regional Forum held in Ghana brought together a wide range of experts to analyse solutions and possible measures to be undertaken. In the Asia-Pacific region, assistance was provided for the

development of the ASEAN Regional Framework on Child Online Protection, building upon the COP Guidelines, in coordination with other partners, including such as TELSOM/TELMIN. Other activities took place in Europe, as part of the regional initiative on enhancing trust and confidence in the use of ICTs.

152. ITU serves as the Secretariat of the Broadband Commission for Sustainable Development. The Working Group on Child Online Safety, led by the World Childhood Foundation and Zain, released its comprehensive report in New York in October 2019. The COP Guidelines were included as a reference and taken as the basis to implement the recommendations of the report.

153. A regional study on national approaches for keeping young people and children safe online was drafted for review and opened for consultations with the countries. Also, assistance was provided to Georgia and Ukraine in the development of a national strategy on child online protection.

154. ITU celebrated Safer INTERNET day 2020 with various activities, including promoting protection of children online. The new COP Mascot was launched on Safer Internet Day 2020. The story and background was designed and created by children at the beginning of January 2020.

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)

155. Recognizing the strong commitment of ITU's work towards bridging the digital divide in the area of the enabling environment, UNDP officially handed over the lead facilitation role on WSIS Action Line C6 Enabling Environment to the ITU in May 2008. Since then, ITU has been acting as the sole facilitator for this Action Line building upon its regular work carried out within the three sectors framework of the ITU-D Programme 3: Enabling Environment.

156. ITU carries out several activities directly related to WSIS Action Line C6, through projects such as the ones listed below. More information on these projects as well as the other projects can be found on the ITU-D Projects webpage (here). The 15th Action Line C6 facilitation meeting was held as an integral component of the 2020 WSIS Forum, on Thursday, 30 July 2020. The theme of this year was: **"Acting now: new and innovative policy and regulatory approaches for digital market development."** This session was mostly focused on the interplay between ICT markets and regulation and the innovative regulatory tools and processes at hand to support Membership and stakeholders to further enable digital transformation. In this regard, telecommunication/ICT regulation should not only focus on competition and consumer protection, but integrate additional goals such as economic development, equitable prices for consumers, and access for all. Governments should ensure they have the tools by which they can have a mature dialogue among all regulators from all sectors. Regulation is a key instrument to enable markets and countries

to build the digital economy. In Africa, one of the biggest issues is still broadband deployment, it is important to address fiscal issues and incentives to facilitate manufacturing and deployment to enable the achievement of SDGs. Gender responsive policies are relevant - women are less connected and not representative in the digital economy. A gender inclusive regulatory response should be considered as a priority for governments. Trust in the system is needed and this requires transparency and improved accurate information.

157. As a main outcome of this session, ICT Regulators, Policy Makers and private sector recognize that regulation – and importantly collaborative regulation – play an important role in digital transformation. One of the main challenges of collaborative regulation at national and regional level is to break across silos, to bring together the expertise and the enforcement power needed to level the playing field across borders. The details of the meeting are available here.

158. This session on Action Line 6 was mostly linked to the SDG 9.

159. The WSIS Prizes 2020 Winner for the Action Line C6 is the Start-up Tunisia, Ministry of Communication Technologies, Tunisia.

STARTUP TUNISIA is an incentive framework for the creation and development of Startups based, in particular, on creativity, innovation and the use of new technologies.

The main objective of STARTUP TUNISIA is to enable the emergence of more than 1,000 startups within 5 years, of which at least one Tunisian Unicorn.

The program is composed of 4 main components: (1) the improvement of the legal framework which is dematerialized by the Startup Act, (2) the Fund of Funds which will be the instrument of support and financing of the ecosystem of startups, (3) the training and support of young people talents, and (4) the integration of different Tunisian regions in this process.

The Startup Act is materialized mainly by: (i) Law No. 2018-20 of 17 April 2018 on Startups;

(ii) Decree No. 2018-840 of 11 October 2018 laying down the conditions, procedures and deadlines for granting and withdrawing the start-up label and the benefits for Startups and the organizations, the operating procedures of the labeling committee; and (iii) Circulars of the Central Bank of Tunisia N ° 2019-01 and 2019-02.

The Startup Act is structured around a Label of Merit and a series of measures for the benefits of Entrepreneurs, Investors and Startups. This framework is designed to facilitate the creation and the growth of Startups in Tunisia. So far, the ministry of communication and digital economy has granted for about 130 Labels for the benefit of startups.

Project website

https://www.startupact.tn/

Sustainable development goals related to this project

- Goal 5: Gender equality
- Goal 8: Decent work and economic growth
- Goal 9: Industry, innovation and infrastructure
- Goal 16: Peace, justice and strong institutions
- Goal 17: Partnerships for the goals

Target beneficiary group(s)

- Youth
- Women
- People with disabilities
- The unemployed
- Migrants
- Remote and rural communities
- Incubators, investors and accelerators

160. ITU continues to assist Member States and Sector Members in developing pro-competitive policy and regulatory frameworks for telecommunications. More specifically, through Objective 3/Output 3.1: Enabling environment: Products and services on telecommunication/ICT policy and regulation for better international coordination and coherence, 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 of our work is to provide the tools for an effective policy, legal and regulatory environment for the ICT sector.

161. We convene global and regional forums to discuss global trends in regulation for Sector Members and other national and international stakeholders, through organizing the Global Symposium for Regulators (GSR) as well as strategic dialogues on topical policy, legal, regulatory, as well as on economic and financial issues and market developments.

162. We provide data, research and analysis and tools to support our members 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.

163. We provide knowledge exchange tools and platforms to enable inclusive dialogue and enhanced cooperation to help countries achieve a more inclusive information society and to raise national and regional awareness about the importance of an enabling environment.

164. We provide direct assistance to countries and regions on an enabling environment for smart connected societies.

165. Examples of projects are listed below.

166. We produce a number of flagship reports including the Global ICT Regulatory Outlook Report focusing on best practice regulation to enable ubiquitous broadband markets to thrive. Various thematic studies provide valuable viewpoints and strategies on multiple issues that affect regulation and economics in a converged broadband world.

- The Global Regulatory Outlook was launched in 2017 (executive summary available at http://www.itu.int/en/ITU-D/Regulatory-Market/Pages/Outlook/2017.aspx) – this is in a new annual series tracking market and regulatory trends in the ICT sector and their implications across the economy. The 2018 Report was launched in Q4 2018, integrating and analyzing data from the 2018 regulatory and tariff surveys. In this year's 2020 edition, available here, we share unique, focused research and offer both evidence and practical advice to support regulators embarked on their journey to fifth generation collaborative regulation. The Benchmark of Fifth Generation Collaborative Regulation (G5 Benchmark), based on GSR19 Best Practice Guidelines together with the ICT Regulatory Tracker, serves as a compass for regulators on their journey of digital transformation, helping establish roadmaps towards regulatory excellence and a thriving digital economy.

- ITU prepared publications on topical regulatory and market environment issues, including a series of reports on The economic contribution of broadband, digitization and ICT regulation, Econometric studies on the impact of broadband, digital transformation, and the interplay of ICT regulation on the economy at global and regional level.

- ITU made improved tools for evidence-based decision-making available to Membership including the ITU-World Bank Digital Regulation Handbook and Platform to provide practical guidance and best practice for policy makers and regulators across the globe concerned with harnessing the benefits of the digital economy and society for their citizens and firms; the ITU REG4COVID platform: a place where regulators, policy makers and other interested stakeholders share best

practices to improve COVID-19 response.; the Global ICT Regulatory Outlook & Tracker: 2020, providing evidence and practical advice to support regulators embarked on their journey to fifth generation collaborative regulation; the ITU Discussion Paper: How Broadband, Digitization and ICT Regulation Impact the Global Economy - Global Econometric Modelling Expert Report; the ITU Discussion Paper: Report Economic Impact of COVID-19 on Digital Infrastructure - Report of an Economic Experts Roundtable; and the ITU Discussion Paper: Pandemic in the Internet Age: communications industry responses (available here).

- Key regulatory and tariff data was gathered, analyzed and published to facilitate evidence-based decision making through ICT Regulatory Tracker, ICT Eye, and relevant reports.

- ITU-D continues to implementing 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 China, Egypt and Mexico through the preparation draft country assessment reports, research on issues relating to ICTs for Digital Financial Inclusion, workshops on collaborative regulation, security and Quality of Service, and is working with the countries to define further priority areas of leveraging ICTs for DFI as part of the Financial Inclusion Global Initiative.

- ITU-D continues to enhance knowledge-exchange tools and platforms such as the ICTEye, the Digital Regulation Handbook and Platform, and the ICT regulatory knowledge centre.

- ITU web portals have been published on International Mobile Roaming (IMR) Resources , Quality of Service, the Digital Ecosystem, Infrastructure Development and the Regional Regulatory Associations Portal was also 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.

167. Key ITU-D gathers and publishes **regulatory and tariff data to facilitate evidence-based decision making**, that include:

- ITU-D has developed the ICT Regulatory Tracker, a unique data-based tool that covers over 186 countries for a period of nine years, showcasing national, regional, and global regulatory progress.

- The annual ITU-D regulatory and tariff questionnaires have been sent to membership to gather information on regulatory and policy issues and tariff policy issues. 2019 regulatory and policy data has been published on the ICT Regulatory Tracker, and made available on the website. Contributions have been made with specific regulatory and policy and tariff/economic information and reports submitted to ITU-D Study Groups and published on the website.

168. ITU-D fosters **key strategic dialogues**, including the Global Symposium for Regulators and the strategic dialogue on International Mobile Roaming, and Economic and Financial Forums, and delivers best practice guidelines on key regulatory and policy issues and approaches.

169. As GSR celebrated its 20th edition, the global community of ICT regulators celebrated 20 years of evolving regulatory frameworks. The anniversary event focused on providing concrete guidance towards achieving meaningful connectivity in the digital transformation.

170. In addition to the high-level panels on topical, cutting edge policy and regulatory issues, GSR-20 featured interactive sessions and trainings, and brought together regulators and policy makers from around the world to provide a global platform for discussions. GSR-20 provided ITU Members with the opportunity to share experiences and knowledge, collaborate and identify evolving regulatory tools and approaches to bring affordable, safe, secure and trusted connectivity and online access and use to people everywhere. Events included: The leadership debate; the GSR-20 Regional Regulatory Roundtable Discussion for Europe and CIS: The Regulatory Wheel of Change: Regulation for Digital Transformation (report here); The GSR-20 Regional Regulatory Roundtable Discussion: Digital Transformation for Digital Economies @COVID-19 South-Asia (report here); The GSR-20 Regional Regulatory Roundtable Discussion: Competition Policy and Analysis in a Digital Apps Environment for the Arab and Africa Regions (report here); a joint USTTI and ITU behind the scenes look at the work taking place to prepare for the deployment and usage of emerging technologies; the Regional Regulatory Associations meeting and the Industry Advisory Group for Development Issues and Private Sector Chief Regulatory Officer's meeting (IAGDI-CRO); the Heads of Regulators Executive Roundtable; and, the core sessions of GSR-20, held from 1 to 3 September 2020.

171. Regulators from around the world identified and endorsed a set of regulatory Best Practice Guidelines under the overall theme of "The gold standard for digital regulation". This year's consultation sought ideas, views and experiences on: Demonstrating regulatory thought leadership for digital transformation; Vectors of regulatory action: inclusiveness, agility, and resilience; and, Collaboration across sectors, cooperation across borders, and engagement across the board. The GSR-20 Best Practice Guidelines have been published and are available here.

172. **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.

173. 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).

174. International mobile roaming remains an important area of work for ITU-T Study Group 3. SG3 issued a questionnaire on the implementation status of Recommendation ITU-T D.98, "Charging in international mobile roaming service" and Recommendation ITU-T D.97 "Methodological principles for determining international mobile roaming rates" (TSB Circular 168 Cor.1 on 14 May 2019); SG3 is considering the results of the questionnaire.

175. ITU also provides support, assistance and training to developing countries in bridging the standardization gap 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. Closing plenaries benefit from full interpretation.

176. 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.

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

178. ITU is actively supporting implementation of enabling environment frameworks to promote ICT accessibility for persons with disabilities in line with Output 4.3 of the 2017 World Telecommunication Development Conference and Connect 2020 Target 2.5B. This work includes:

- The development of key resources in ICT accessibility, including:
  - A set of three free self-paced online certificate training courses entitled "ICT Accessibility: the key to inclusive communication" was developed in 2018 in response to the outcomes of WTDC-17, and the ITU Regional Initiative for Europe, aiming to provide a general understanding of ICT accessibility policies, regulations, technology trends, and public procurement rules. These consist of three modules as follows: Module 1: Enabling communication for all though ICT accessibility; Module 2: ICT accessibility policy regulations and public procurement standards; Module 3: Achieving ICT accessibility through public procurement.
  - Fifteen video tutorials on how to develop and remediate accessible digital documents (e.g., Word, Pdf, Excel, PP, etc.) were developed in Spanish, English, and French and launched during the Study Group on Q7/1 to ITU Members on 28 September 2018.

- An online self-paced course entitled 'Web Accessibility - The cornerstone of an Inclusive Digital Society' is being developed in 2019, to be made available through ITU Academy, which is composed of 3 modules: Module 1: Executive tools for developing a web accessibility policy; Module 2: Essentials of implementing a web accessibility evaluation; Module 3: Technical skills for designing and developing accessible websites. The learner develops an overall understanding of the main issues relating to web accessibility, including: web accessibility policy development, the creation of accessible digital content, the evaluation of level of accessibility of the websites, principles related to the design and development of accessible websites and maintenance of accessible websites, in line with the international standards related to web accessibility.

– A series of reports to support decision makers on how to ensure accessible ICT devices and services are widely available in their countries. These publications, available in all 6 official ITU languages and accessible e-book versions, include the following:

  - Model ICT Accessibility Policy Report. This report includes model policy, regulations, codes of conduct and legislation that can be adopted and adapted by ITU Member States based on their priorities (mobile, web, public access center and TV/audio visual media accessibility as well as changes to existing ICT legislation and a model policy for the public procurement of accessible ICTs);

  - Making Mobile Phones and Services accessible for Persons with Disabilities. G3ict-ITU;

  - Making Television Accessible Report. G3ict-ITU,

– In the 2017-2021 study period this topic is addressed by ITU-D Study Group 1 Question 7/1: Access to telecommunication/ICT services by persons with disabilities and other persons with specific needs. The final report from the 2014-2017 study period on "Access to telecommunications/ICT services by persons with disabilities and with specific needs" is available at the following link. Throughout the study periods BDT has provided capacity building and training to the members on ICT accessibility and related topics.

– Capacity in ICT Accessibility was built among all participants to the meeting of the Rapporteur Group of Q7/1 on 28 September 2018.

– ITU continues to develop standards in ITU-T study groups (SGs) to promote accessible ICT technologies: Work on human factors is now reinforced within SG16 after its move from SG2 in 2017. ITU-T Q24/16 (Human factors related issues for improvement of the quality of life through international telecommunications) and ITU-T Q26/16 (Accessibility to multimedia systems and services) progressed their work on Accessibility and Human factors related issues for improvement of the quality of life through international telecommunications. The ITU Inter-sector Rapporteur Group on Audio-visual Media Accessibility studies topics related to audio-visual media accessibility for all media delivery systems including broadcast, cable, Internet, and IPTV.

- ITU-T Study Groups develop technical standards (called *Recommendations*) to further the use of ICTs to enable accessibility. A sample of recently developed standards include:

- ITU-T SG16 developed

  - **Recommendation ITU-T F.922 "Requirements of information service systems for visually impaired persons"** provides requirements for establishing an information service system for visually impaired persons (ISS-VIP) which is based on mobile internet. ISS-VIP is constructed in C/S mode, VIPs and volunteers could access this system through their client software, and use the service provided by this system, or provide service for another person through this system. ISS-VIP provides three kinds of services, i.e. image recognition service, video assist service and trip companion service.

  - **Recommendation ITU-T H.702 (V2) (revised) "Accessibility profiles for IPTV systems" (under approval)** defines three profiles for accessibility features in IPTV systems, with increasing levels of support. Accessibility information such as caption, sign language and audio description that are sent separately from video contents to IPTV terminal devices. By defining the above profiles, persons with disabilities can choose more easily the terminal devices that have the functions they need. The set of parameters within each profile were identified in consultation with the assistance of persons with disabilities participating in the work of ITU-T. This version includes the accessibility profiles for cognitive disabilities and appendix about an example for H.702 based system, and harmonizes the latest term definitions.

  - **Recommendation ITU-T H.704 "Enhanced UI framework for IPTV terminal device - Gesture control interface" (under approval)** defines the general requirements, functional elements and interfaces supporting enhanced capability of user interaction by gesture recognition and controlling over IPTV terminal devices, based on the enhanced user interface (UI) framework defined in [ITU-T H.703]. Those functional elements are described in the gesture controlling enabler and gesture recognition enabler defined in this Recommendation. Moreover, the procedures of interaction between gesture recognition device and gesture-controlled device are defined with the recommended information used in the interaction. This Recommendation enables the gesture controlling feature in the Enhanced IPTV User Interface defined in [ITU-T H.703]. With those features, users can control the operation of IPTV applications in an IPTV terminal device in a convenient, natural and comfortable way.

- The Joint Coordination Activity on Accessibility and Human Factors (JCA-AHF) is mandated to reinforce cooperation within ITU, other UN agencies and activities, ISO, IEC, regional and national SDOs, industry groups, academia, disability organizations and telecommunication user groups for persons with disabilities, with the aim of increasing standardization experts' awareness of the importance of accessibility to ICTs and the need to mainstream the consideration of accessibility in international standardization efforts.

- JCA-AHF meetings take place at least twice a year with accessibility experts including persons with disabilities, each with TSB-provided teleconference facilities, a tool for remote sharing of documents (Adobe Connect), sign-language interpretation and real-time captioning on request.
- Webinar sessions on accessibility were organized during WSIS Forum 2020:
  - Make Listening Safe and create the world where nobody's hearing is put in danger due to unsafe listening by ITU-T and WHO on 13 July 2020
  - How to engage the whole audience: Innovation in media accessibility by the IRG-AVA on 15 July 2020
  - ICTs and Accessibility: Leaving Nobody Behind in the age of Smart Cities and Advances in Technology by the JCA-AHF on 17 July 2020
- TSB contributed to the following ITU events:
  - Accessible Americas 2019 (Quito, 20-22 November 2019)
  - Accessible Europe 2019 (Malta, 4-6 December 2019)

179. 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)

180. 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 2020, 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 2020, 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 15th Action line Facilitation meeting of C1, C7 and C11 was held on Monday, 24 August 2020 on the topic of "Digital government during the times of pandemic and beyond." The session highlighted the 2020 edition of the United Nations E-Government Survey. It included an in-depth presentation of the Survey data and results, followed by expert reflections on the findings.

181. Concerning the outcomes of this session, they are as follows:

- As a development tool, the United Nations E-Government Survey provides policymakers with evidence- based information and policy options that help governments understand their relative and contextual strengths and challenges, and to consider options on the way forward in mobilizing e-government for implementing the 2030 Agenda.
- Globally, a continued increase in the uptake of e-government development is evident, with 65 per cent of Member States now in the high or very high EGDI group. More than 22 per cent of the countries surveyed have moved to a higher EGDI group since 2018. Progress has been especially noteworthy in countries in special situations (LDCs, LLDCs and SIDS).
- While there tends to be a positive correlation between the EGDI ranking and the income level of a country, financial resources are not the only critical factor in e-government development. Very often, a strong political will, strategic leadership, and the commitment to expanding the provision of digital services (as measured by the Online Service Index, or OSI) will allow a country to achieve a higher EGDI rank than might otherwise be expected.
- The provision of digital government services has improved significantly; more than 84 per cent of countries now offer at least one online transactional service, and the global average is 14. The most common digital services offered worldwide are registering a new business, applying for a business licence, applying for a birth certificate, and paying for public utilities.For more details on the sessions and the outcomes, please see here.

182. The WSIS Prizes 2020 Winner for the Action Line C1 is Digital Clinic, Infocomm Media Development Authority, Singapore.

The Digital Clinic is a community initiative, led by corporate volunteers known as SG:D Friends, who contribute their time to give one-on-one assistance to anyone who has queries on how to use mobile devices.

As Singapore transforms digitally, there is an urgent need to ensure that everyone is digitally ready and that no one is left behind. Although the percentage of Internet Users in Singapore is generally high at 87%, the percentage for seniors is significantly lower and one in two seniors 60 years old and above are not Internet Users. The key reason cited for not using the Internet is the lack of knowledge and skills.

To encourage usage of technology, there is a need for greater support and customised learning for seniors who are digital non-natives.

The Digital Clinic supports one of the strategies in the Digital Readiness Blueprint, focusing on providing one-on-one assistance to make it easy for Singaporeans to adopt technology so that non-digital natives can become more confident and comfortable in using technology to participate in digital activities.

In collaboration with partners, IMDA identified libraries and community clubs to organise weekly Digital Clinics in the heartlands where there is a higher population of seniors. Private and public organisations are invited to volunteer for these Digital Clinics, which pops-up at each location for 3 to 8 hours, giving seniors easy access to nearby dedicated one-on-one concierge-type assistance on the use of smartphones. Some of the common questions asked at Digital Clinics include personalising phone settings, connecting to the internet, storage, online banking and more.

Since its launch in Nov 2017 the number of participating organisations has grown from 8 to 37 with over 4,000 volunteers to benefit 10,000 seniors island-wide (https://youtu.be/2p2-mMrdo6s).

Project website

http://www.imsilver.sg/dc

Sustainable development goals related to this project

- Goal 3: Good health and well-being
- Goal 4: Quality education
- Goal 16: Peace, justice and strong institutions

Target beneficiary group(s)

- Older persons
- Mature Adults

183. The ITU has been contributing greatly to WSIS implementation and follow-up since its inception to the present. In 2020, 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 2020.

184. 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 create a better digital future for all. In 2020, ITU Virtual Digital World 2020 took place online from 20 to 22 October, bringing together ministers, regulators and tech experts to showcase and debate the role of digital technologies at in the COVID-19 era. On the theme "Building the digital world. Together", the event was a dynamic virtual experience exploring the comprehensive digital transformation in the region and globally, focusing on key issues relating to the development of the digital economy, today and tomorrow. The highlights

are available here: https://www.itu.int/en/ITUTELECOM/Pages/highlights.aspx. ITU Digital World 2021 will be held in Ha Noi, Viet Nam, in October 2021.

185. 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 Sector. Three meetings of the Telecommunications Standardization Advisory Group took place from 23-27 September 2019, 10-14 February 2020, and 21-25 September 2020. (Please see http://www.itu.int/en/ITU-T/tsag/2017-2020/Pages/default.aspx)
- Radiocommunication Advisory Group (RAG) for the ITU-R. The 27th RAG meeting took place on 25-27 May 2020. (Please see https://www.itu.int/en/ITU-R/conferences/rag/Pages/default.aspx)

186. **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".

- The ITU-D Study Groups organized two thematic workshops during the WSIS Forum 2020:
  - "Facing Realities in Digital Transformation: Emerging Trends and Challenges", which provided an insight on ITU-D Study Groups current activities and explored opportunities for stronger collaborations and synergies with WSIS.
  - "A roadmap to a trusted Cloud for Good", which focused on how to progress further in building trust in the cloud, especially given its increased usage in the wake of COVID-19.
- 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 http://www.itu.int/en/ITU-R/study-groups/Pages/default.aspx)

187. **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 seventh WTDC (WTDC-17) of ITU** was held from 9 to 20 October 2017 in Buenos Aires, Argentina, under the theme of "ICT for Sustainable Development Goals.

– The ITU World Telecommunication Development Conference WTDC-21 will be hosted by the Government of Ethiopia. The conference will take place in Addis Ababa from 8-19 November 2021.

For additional information please see:
http://www.itu.int/en/ITU-D/Conferences/WTDC/WTDC17/Pages/default.aspx

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

188. In 2020, 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

189. 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.

190. The WSIS Prizes 2020 **Winner** for the Action Line C3 is UAE Infrastructure Geo-spatial Platform, Ministry of Energy and Infrastructure, United Arab Emirates.

وزارة تطوير البنية التحتية
MINISTRY OF INFRASTRUCTURE DEVELOPMENT

UAE Infrastructure Geospatial Platform is A “one-stop shop” to deliver trusted, nationally consistent geospatial data and services. It provides a suite of well-managed, highly available, and trusted geospatial data, services, and applications for use by the governments agencies and citizens.

The major purposes of the platform are to:

1. Enable Federal agencies and their partners to publish and catalog interoperable web services for all geospatial data, including data identified as “nationally significant” 2. Enable Federal agencies and their partners to develop and share geospatial services and applications through the use of shared application hosting infrastructure and source code sharing capabilities;

3. Offer a mechanism through which Federal agencies can access and/or procure commercially licensed geospatial data and tools by leveraging shared infrastructure and common procurement mechanisms; and

4. Empower a new generation of geospatial collaboration by enabling users of all types to develop and share maps and services with data from trusted content along with user-contributed data.

To enable these different capabilities fully in the site, a range of user accounts with varying privileges and access rights will be implemented.

Additionally, policies and procedures to support the provisioning and use of these accounts should be established and implemented.

Project website

https://geoportal.moid.gov.ae/msdi/HomeEn.aspx

Sustainable development goals related to this project

- Goal 9: Industry, innovation and infrastructure
- Goal 11: Sustainable cities and communities
- Goal 13: Climate action
- Goal 17: Partnerships for the goals

Target beneficiary group(s)

- Youth
- Women
- Remote and rural communities
- Government Agencies , Citizens , Tourist , students , SMEs and the public

191. 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

192. The **World Radiocommunication Conference 2019 (WRC-19)** was held in Sharm el-Sheikh, Egypt from 28 October to 22 November 2019. A total of 3,420 participants representing 163 Member States and 129 observer organizations attended the event. https://www.itu.int/en/ITU-R/conferences/wrc/2019/Pages/default.aspx 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 it's Final Acts came into force on 1 January 2017.

193. 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.

194. 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-20 is scheduled to be held in a fully virtual format from 30 November – 11 December 2020.

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

195. Within the framework of its mandate as facilitator for Action Line C4, the ITU organized the facilitation meeting of Action Line C4 on capacity building which took place as an integral part of the WSIS Forum 2020. The meeting which was jointly organised with ILO as the lead facilitator for Action Line C7: E-employment, took place on Wednesday, July 29 from 13:00 to 14:00 under the theme of "Digital skills and the future of work: Challenges and opportunities in a post Covid-19 environment." The session which was virtual, was attended by around 129 participants. The session focused on the critical role of digital skills and digital jobs in a post COVID-19 pandemic, the related challenges, and opportunities, including teleworking and digital learning in a COVID-19 environmentsupports the achievement of Sustainable Development Goal Number 4 (SDG 4) on ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all by 2030. The session discussed information on

interventions designed to support digital skills development for employment, as well as information on useful tools and ongoing initiatives to addresses digital skills requirements for employment.

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

- AI and cloud computing are reshaping our global economy and transforming how we live, work and learn.
- Countries need to undertake digital skills assessments to establish what their levels of digital skills are and which digital skills they need.
- The COVID-19 pandemic turns out to be very disruptive and puts a lot of pressure on traditional employment policies.
- Organizations need to establish a humanitarian approach to digital inclusion and livelihoods.
- Education plays a huge role in creating a society with a digital identity.
- It is possible for countries to achieve high levels of digitization if Governments invest in appropriate strategies.
- Those who are not advancing rapidly in the adoption of new technologies and the digital skills development are at risk of being excluded from the digital economy.
- People with less skills have been impacted more by COVID-19 and particularly women, the elderly, and underserved communities
- The increase in demand for digital jobs is putting pressure on policy makers to adapt traditional employment policies
- Covid-19 lockdown has closed programs on digital skills for young people who do not have access to Internet, as they cannot access ICT centers.

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

198. 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: 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: The C4 action line 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.

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

- The need to take technology to those who need it, and teach them how to use it continues to be a priority in many parts of the world
- People with less skills have been impacted more by COVID-19 and particularly women, the elderly, and underserved communities

200. The WSIS Prizes 2020 Winner for the Action Line C4 is the Siberkreasi (Indonesia's National Movement for Digital Literacy), Siberkreasi, Indonesia.

Siberkreasi aims to enhance and strengthen positive impact of technology. We are supported by a group of people with a common heart and vision to promote digital literacy for a better Internet for all. We pursue our objectives with these 4Cs that are manifested in our groundbreaking programs:

-Curriculum development

We initiate Pandu Digital (http://pandudigital.id/) or Digital Scout, which is designed to pave the way for digital literacy education. We also initiate School of Influencer which aims to encourage youths in order to make and spread positive contents.

-Collaborative engagement

We bring together various groups who have contributed to the sustainability of digital literacy campaign. For example, we establish a website called StopHoax.id (http://stophoax.id); to combat the spread of hoaxes and to clarify false information circulated on the Internet.

- Community empowerment

We develop a batik-producing village called Desa Mandhing, near Yogyakarta (http://batiksiberkreasi.id). The community is taught to use technology for selling their craft and to use batik as a medium for digital literacy campaign.

- Cyber Governance

We took a substantial part in the national ID-IGF this November.

Since those programs' initiation in October 2017 until October 2019, we have achieved:

- 442 locations that have been reached out for digital literacy programs

- 3137 Digital Scouts that have been sworn in to be digital literacy volunteer

- 180.000 active participant that have joined digital literacy workshop by Siberkreasi

- 180.000 downloads on 73 book of Digital Literacy series that are available free for public

- 75 millions of Indonesian populations have been disseminated through mainstream media and social media

For the last 2 years, we have generated more than 700 content creators (beginner & intermediate level). Moreover, from the post-event-survey, more than 30% respondents believe that they comprehend digitalization better.

Project website

http://siberkreasi.id

Sustainable development goals related to this project

- Goal 4: Quality education

Target beneficiary group(s)

- Youth
- SMEs Communities, Adults, Students

201. 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.

202. 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 29 new Centres were selected for the 2019-2022 cycle, out of a total of 64 applications received and processed. Regional Steering Committee meetings were

held in the first quarter of the year, and all the centres are now fully functional. Training activities under the Centres of Excellence have been taking place in all the 6 regions.

203. A regional governance structure for the Centres of Excellence has been put in place in the form of regional Steering Committees which meet once 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.

204. 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.

205. As the main ITU umbrella for training activities, the ITU Academy has finalised the development of 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. A Quality of Service Training Program (QoSTP) has also been developed and is ready for delivery. 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.

206. 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. The Initiative contributes to the broader goal of building an inclusive digital society, and ensuring that lack of knowledge and skills is not a barrier to participation in the digital economy. In response to the COVID-19 crisis, DTC trainers will be provided with tools and skills on how to conduct remote teaching. The train-the-trainers online course will be offered in collaboration with Cisco and will be free of charge.

207. 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. The new website menu and structure provide an opportunity for all three ITU bureaus to showcase their work in capacity development activities and updated it on a regular basis. With the introduction of menu items such as "Capacity development", "Curriculum development", "Research and publications" and an improved course search, the ITU Academy caters to the need of all ITU divisions to share their latest work in capacity development in an online access point that is specifically dedicated to learning and training resources and activities. 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.

208. The following RRS were held in 2019 and 2020:

1) **RRS-19 Africa**, Johannesburg, South Africa, 13-17 May 2019
2) **RRS-20 Americas**, Online meeting, 13-24 July 2020

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)

209. The Action line C7 E- Government Facilitation Meeting was held on Monday, 24 August 2020 together with the Action Lines C1 and C11. The title of this session was "Digital government during the times of pandemic and beyond." 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.

210. The WSIS Prizes 2020 Winner for the Action Line 7 on e-Government is the Sabooj Sathi Online 3.0, Backward Classes Welfare Department, India.

State Government's endeavor and commitment has established primary and upper primary schools within walking distance.The students, particularly from economically and socially disadvantaged background and especially Girls many a times had to drop out from high Schools owing to the distance. To ensure that all students graduating from upper primary schools (8th Standard) could continue in the high schools, Government of West Bengal announced the flagship scheme titled "Sabooj Sathi" in 2015-16 for providing bi-cycles to all students of Class IX to XII in Government Schools withmain objective to increase access to high schools.

The scheme was also expected to increase retention, inculcate sense of confidence amongst the girl students and promote environment-friendly and healthy means of transportation, aligned to four Sustainable Goals of agenda 2030- SDG3: Good Health & Well-being, SDG4: Quality Education, SDG5: Gender Equality and SDG13: Climate actions.

Sabooj Sathi Online 3.0 (www.wbsaboojsathi.gov.in) is the e-Governance mechanism which ensures end-to-end ICT enabled management of entire processes involved in implementation.

Hon'ble Chief Minister of West Bengal Mamata Banerjee flagged off the Sabooj- Sathi on 29th October 2015. Around 8.00 million students have already received bi-cycles so far, another 0.4 million will receive bicycles by December 2019. The scheme is continuing and the students are receiving bi-cycles immediately on admission in class IX.

During the last four years of implementation, enrolment in high school increased by 12%; among the students appearing in Board exams girl students are more than the boys. The bi-cycles increased general mobility of the students, particularly the girls. These bi-cycles are also being used for various domestic and social purposes. According to Pratichi (India) Trust, an organisation founded by Nobel Laureate Dr. Amartya Sen, these bi-cycles are breaking many boundaries.

Project website

https://wbsaboojsathi.gov.in

Sustainable development goals related to this project

- Goal 1: No poverty
- Goal 3: Good health and well-being
- Goal 4: Quality education
- Goal 5: Gender equality

Target beneficiary group(s)

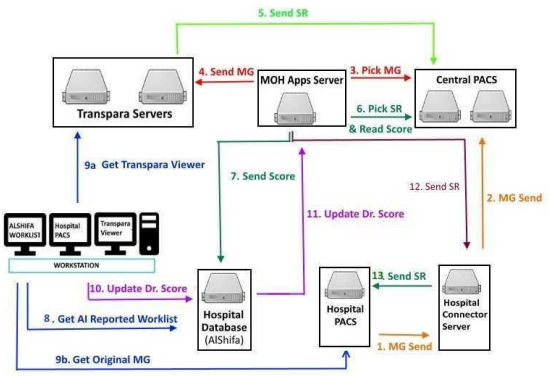
- Youth
- Women

- Indigenous and nomadic peoples
- The poor
- Remote and rural communities
- Students

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)

211. The WSIS Prizes 2020 Winner for Action Line C7 on E-Health is the Early Diagnosis of Breast Cancer using Artificial Intelligence (AI), Ministry of Health, Oman.



This project aimed at aiding the radiologist in the early detection of Breast Cancer by analyzing mammograms using AI thereby saving the patient's life and reducing the costs associated with treatment of cancer. In addition, because there are fewer qualified experts in this field in MOH, Oman, this also would aid in processing more no. of patients than currently possible.

Results Achieved: The radiologists were able to process many more patients and focus their attention on the patients where AI reported positive findings while reliving the patients with negative findings. They were also able to detect with higher degree of accuracy the cases, which were in Early Stages of Cancer thereby reducing the cost of the treatment.

The following Impact generated as follow:

a. Reducing the turnaround time of reporting especially of positive cases.

b. Reduction in the need of multiple qualified experts to report.

c. Reduction in False Positives

d. Less Errors due to human fatigue

e. Early Detection means less impact on the person and their family

f. Reduction in healthcare costs

Project website

https://www.moh.gov.om/en/home

Sustainable development goals related to this project

- Goal 3: Good health and well-being
- Goal 9: Industry, innovation and infrastructure

Target beneficiary group(s)

Women

212. 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.

213. 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).

214. 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.

215. ITU-T SG16 developed updates to the personal connected health specifications in the **ITU-T H.810-H.850 series of Recommendations**, where two new and 37 revised conformance testing specifications were approved for the third edition of the Continua Design Guidelines (CGD) in the ITU-T H.810 series. With this updates, developers will be able to check compliance of their implementations of H.810 devices and systems to the latest version of the CDG.

216. ITU-T SG16 developed new and updated conformance testing specifications for the **ITU-T H.810 Continua Design Guidelines (CDG)** in the ITU-T H.810-series of Recommendations has been updated to the 4th edition ("Keratin", CDG 2017) with 5 new and 7 revised draft texts under approval. The updates cover testing for new device specializations for power status monitoring and updated glucose monitors, and updates the PCD-1 observation upload capability.

    - **Recommendation ITU-T H.810 (revised) "Interoperability design guidelines for personal connected health systems: Introduction":** The Continua Design Guidelines (CDG) defines a framework of underlying standards and criteria required to ensure the interoperability of devices and data used for personal connected health. It also contains design guidelines (DGs) that further clarify the underlying standards or

specifications by reducing options or by adding a missing feature to improve interoperability. These guidelines focus on the following interfaces:

- Personal Health Devices (PHD) interface – Interface between a Personal Health Device (PHD) and a Personal Health Gateway (PHG).
- Services interface – Interface between a Personal Health Gateway (PHG) and the Health & Fitness Service (HFS).
- Healthcare Information System (HIS) interface – Interface between the HFS and the Healthcare Information System (HIS).

- **Recommendation ITU-T H.813 (revised) "Interoperability design guidelines for personal connected health systems: Healthcare Information System interface":** The Continua Design Guidelines (CDG) defines a framework of underlying standards and criteria that ensure the interoperability of devices and data used for personal connected health services. The Continua Design Guidelines also contains design guidelines (DGs) that further clarify underlying standards or specifications by reducing options or by adding missing features to improve interoperability. ITU-T H.813 focuses on the following interface:
  - HIS-IF – Interface between Health & Fitness services (HFS) and the Healthcare Information System (HIS).
- **Recommendation ITU-T H.830.15 (revised) "Conformance of ITU-T H.810 personal health system: Services interface Part 15: FHIR Observation Upload: Health & Fitness Service sender"** provides a test suite structure (TSS) and the test purposes (TPs) for fast healthcare interoperability resource (FHIR) Observation Upload through the Health & Fitness Service (HFS) sender in the Services interface, based on the requirements defined in the Recommendations of the ITU-T H.810 sub-series, of which Recommendation ITU T H.810 (2017) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

  Recommendation ITU-T H.830.15 includes an electronic attachment with the protocol implementation conformance statements (PICSs) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.
- **Recommendation ITU-T H.841 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 1: Optimized Exchange Protocol: Personal Health Device"** provides a test suite structure (TSS) and the test purposes (TP) for personal health devices using the IEEE 11073-20601 optimized exchange protocol in the Personal Health Devices (PHD) interface, based on the requirements defined in the Recommendations of the ITU-T H.810 sub-series, of which Recommendation ITU T H.810 (2017) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

  Recommendation ITU-T H.841 is a transposition of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 1: Optimized Exchange Protocol. Personal Health Device (Version 1.11, 2017-03-14), that was developed by the Personal Connected Health Alliance. A number of versions of this

specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A. The updates include the following aspects:

– Updates related to the inclusion of the value "7946" according to CDG2017 document, H812.1 H.812.1 - Observation Upload, corresponding to "MDC_TIME_SYNC_EBWW" and according to bugzilla 1164 and 1165.

- **Recommendation ITU-T H.842 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 2: Optimized Exchange Protocol: Personal Health Gateway"** provides a test suite structure (TSS) and the test purposes (TPs) for personal health gateways (PHGs) using the IEEE 11073-20601 optimized exchange protocol in the Personal Health Devices (PHD) interface, based on the requirements defined in the Recommendations of the ITU-T H.810 sub-series, of which Recommendation ITU T H.810 (2017) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface. Recommendation ITU-T H.842 is a transposition of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 2: Optimized Exchange Protocol: Personal Health Gateway (Version 1.8, 2017-03-14), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.
- **Recommendation ITU-T H.844 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 4: Continua Design Guidelines: Personal Health Gateway"** provides a test suite structure (TSS) and the test purposes (TP) for Personal Health Gateways (PHGs) in the Personal Health Devices (PHD) interface, based on the requirements defined in the Recommendations of the ITU-T H.810 sub-series, of which Recommendation ITU T H.810 (2017) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface. Recommendation ITU-T H.844 is a transposition of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 4: Continua Design Guidelines. Personal Health Gateway (Version 1.8, 2016-09-20), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.
- **Recommendation ITU-T H.845.17 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 5Q: Power status monitor"** provides a test suite structure (TSS) and the test purposes (TPs) for the power status monitor (PSM) of personal health devices in the Personal Health Device (PHD) interface, based on the requirements defined in the Recommendations of the ITU-T H.810 sub series, of which Recommendation ITU T H.810 (2017) is the base Recommendation. The objective of this test specification is to provide a high

probability of interoperability at this interface. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

- **Recommendation ITU-T H.846 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 6: Device specializations: Personal Health Gateway"** provides a test suite structure (TSS) and the test purposes (TP) for Personal Health Gateways in the Personal Health Devices (PHD) interface, based on the requirements defined in the Recommendations of the ITU-T H.810 sub-series, of which Recommendation ITU T H.810 (2017) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface. Recommendation ITU-T H.846 is a transposition of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 6: Device Specializations. Personal Health Gateway (Version 1.9, 2016-09-20), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A. This 2019 revision includes the power status monitor of Personal Health Devices device specialization (ISO/IEEE 11073-10427:2018) test cases as well as minor corrections.
- **Recommendation ITU-T H.850 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 10: Transcoding for Bluetooth Low Energy: Personal Health Gateway - General requirements"** provides a test suite structure (TSS) and the test purposes (TP) for the general requirements when transcoding by personal health gateways in the Personal Health Devices (PHD) interface of application-level data between the Bluetooth Low Energy Bluetooth Generic Attribute Profile (GATT) format and the IEEE 11073-20601 data format, of which Recommendation ITU T H.810 (2016) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface. Recommendation ITU-T H.850 is a transposition of clause 3.2 of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 10: PHD Transcoding Whitepaper. Personal Health Gateway (Version 1.7, 2017-07-18), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

  This Recommendation was originally approved as a single part, but due to its large size it was split at publication time into eight sub-parts for easier use, maintenance and expandability:

  - – ITU-T H.850 with the general requirements;
  - – ITU-T H.850.1 with thermometer PHD requirements;
  - – ITU-T H.850.2 with blood pressure PHD requirements;

- – ITU-T H.850.3 with heart rate PHD requirements;
- – ITU-T H.850.4 with glucose meter PHD requirements;
- – ITU-T H.850.5 with weighing scales PHD requirements;
- – ITU-T H.850.6 with pulse oximeter PHD requirements;
- – ITU-T H.850.7 with continuous glucose monitoring PHD requirements.

- **Recommendation ITU-T H.850.1 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 10A: Transcoding for Bluetooth Low Energy: Personal Health Gateway – Thermometer"** provides a test suite structure (TSS) and the test purposes (TP) for the transcoding of thermometer data by personal health gateways in the Personal Health Devices (PHD) interface of thermometer device application-level data between the Bluetooth Low Energy Bluetooth Generic Attribute Profile (GATT) format and the IEEE 11073-20601 data format, of which Recommendation ITU T H.810 (2016) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

  Recommendation ITU-T H.850.1 is a transposition of clause 3.3 of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 10: PHD Transcoding Whitepaper. Personal Health Gateway (Version 1.7, 2017-07-18), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A. The updates include the following aspects:

  – Updates related to the value of the Reg-Cert-Data-List according to the CDG2017-Q2.

- **Recommendation ITU-T H.850.2 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 10B: Transcoding for Bluetooth Low Energy: Personal Health Gateway - Blood pressure"** provides a test suite structure (TSS) and the test purposes (TP) for the transcoding of blood pressure data by personal health gateways in the Personal Health Devices (PHD) interface of application-level data between the Bluetooth Low Energy Bluetooth Generic Attribute Profile (GATT) format and the IEEE 11073-20601 data format, of which Recommendation ITU T H.810 (2016) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

  Recommendation ITU-T H.850.2 is a transposition of clause 3.4 of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 10: PHD Transcoding Whitepaper. Personal Health Gateway (Version 1.7, 2017-07-18), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A. The updates include the following aspects:

– Updates related to the value of the Reg-Cert-Data-List according to the CDG2017-Q2.

- **Recommendation ITU-T H.850.3 "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 10C: Transcoding for Bluetooth Low Energy: Personal Health Gateway - Heart-rate"** provides a test suite structure (TSS) and the test purposes (TP) for the transcoding of heart rate data by personal health gateways in the Personal Health Devices (PHD) interface of application-level data between the Bluetooth Low Energy Bluetooth Generic Attribute Profile (GATT) format and the IEEE 11073-20601 data format, of which Recommendation ITU T H.810 (2016) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

  Recommendation ITU-T H.850.3 is a transposition of clause 3.5 of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 10: PHD Transcoding Whitepaper. Personal Health Gateway (Version 1.7, 2017-07-18), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A. The updates include the following aspects:

  – Updates related to the value of the Reg-Cert-Data-List according to the CDG2017-Q2.

- **Recommendation ITU-T H.850.4 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 10D: Transcoding for Bluetooth Low Energy: Personal Health Gateway - Glucose meter"** provides a test suite structure (TSS) and the test purposes (TP) for the transcoding of glucose meter data by personal health gateways in the Personal Health Devices (PHD) interface of application-level data between the Bluetooth Low Energy Bluetooth Generic Attribute Profile (GATT) format and the IEEE 11073-20601 data format, of which Recommendation ITU T H.810 (2016) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

  Recommendation ITU-T H.850.4 is a transposition of clause 3.6 of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 10: PHD Transcoding Whitepaper. Personal Health Gateway (Version 1.7, 2017-07-18), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A. The updates include the following aspects:

  – Updates related to the value of the Reg-Cert-Data-List according to the CDG2017-Q2.

- **Recommendation ITU-T H.850.5 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 10E: Transcoding for Bluetooth Low Energy: Personal Health Gateway - Weighing scales"** provides a test

suite structure (TSS) and the test purposes (TP) for the transcoding of weighing scales data by personal health gateways in the Personal Health Devices (PHD) interface of application-level data between the Bluetooth Low Energy Bluetooth Generic Attribute Profile (GATT) format and the IEEE 11073-20601 data format, of which Recommendation ITU T H.810 (2016) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

Recommendation ITU-T H.850.5 is a transposition of clause 3.7 of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 10: PHD Transcoding Whitepaper. Personal Health Gateway (Version 1.7, 2017-07-18), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A. The updates include the following aspects:

– Updates related to the value of the Reg-Cert-Data-List according to the CDG2017-Q2.

- **Recommendation ITU-T H.850.6 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 10F: Transcoding for Bluetooth Low Energy: Personal Health Gateway - Pulse oximeter"** provides a test suite structure (TSS) and the test purposes (TP) for the transcoding of pulse oximeter data by personal health gateways in the Personal Health Devices (PHD) interface of application-level data between the Bluetooth Low Energy Bluetooth Generic Attribute Profile (GATT) format and the IEEE 11073-20601 data format, of which Recommendation ITU T H.810 (2016) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface. Recommendation ITU-T H.850.6 is a transposition of clause 3.8 of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 10: PHD Transcoding Whitepaper. Personal Health Gateway (Version 1.7, 2017-07-18), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.
- **Recommendation ITU-T H.850.7 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 10G: Transcoding for Bluetooth Low Energy: Personal Health Gateway - Continuous glucose monitoring"** provides a test suite structure (TSS) and the test purposes (TP) for the transcoding of continuous glucose monitoring data by personal health gateways (PHGs) in the Personal Health Devices (PHD) interface of application-level data between the Bluetooth Low Energy Bluetooth Generic Attribute Profile (GATT) format and the IEEE 11073-20601 data format, of which Recommendation ITU T H.810 (2016) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

Recommendation ITU-T H.850.7 is a transposition of clause 3.9 of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 10: PHD Transcoding Whitepaper. Personal Health Gateway (Version 1.7, 2017-07-18), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition. This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A. The updates include the following aspects:

– Updates related to the value of the Reg-Cert-Data-List according to the CDG2017-Q2.

- **Recommendation ITU-T H.862.1 "Data model for sleep management services"**: Sleep could affect labour productivity, healthcare in many fields of human factors. While previous sleep management markets focused on furniture including bedding and medical sleep management, current trends include a new form of sleep management technology, including a convergence of existing sleep management methodology and ICT. The reference model of the sleep management service and sleep safety services were introduced in ITU H.862.0. This Recommendation describes the data model for the sleep management services. The scope of this Recommendation is focused on the structured model of data for expressing data collected from sensors as information such as sleep time, sleep stage, and sleep goal to apply to sleep management services.

  In many fields of human factors including healthcare, sleep data can be obtained from a variety of sensors such as EEG, ECG, pulse, motion, sound. From the data, sleep time and sleep quality can be calculated. A general sleep management services that can handle multiple devices independently of the raw data should be able to represent the quantity and quality of sleep. This can be present the sleep stage and its time.

- **Recommendation ITU-T H.862.2 "Framework of annotation methods for biosignal data":** In many fields of human factors including healthcare, various types of data are produced by different institutions. Biosignals are various signal-based data obtained from the human body and include voice, temperature, ECG, EEG and EMG. The purpose of this Recommendation is to define the framework of annotation methods for biosignal data. The scope of this Recommendation is focused on the method of temporally expressing the occurrence interval of an event generated from a biosignal, and the ontology for label mapping.

  In recent years, the use of biosignal data in diagnosis, treatment, and health management has become an important issue. Health data generated from different medical sites and individuals contain various information about health conditions, and a unified method of expressing annotation biosignal data is required to allow interoperability. This Recommendation covers the ontology for label mapping.

- **Recommendation ITU-T H.862.3 "Requirements of voice management interface for human-care services"**: Human-care services are related issues for improvement of the quality of life providing what is necessary for the health, welfare, and protection of people. Various voice-based services are being developed from a nursing robot to care patients and to identify problems through conversation with patients, to the technology for early diagnosis of dementia from voice. This Recommendation describes requirements of voice management user interface (UI) for human-care

services. The scope of this Recommendation is focused on the classification of users and services for voice UI in human-care services such as healthcare fields.

The technology of speech recognition in traditional healthcare sector has been used only to enhance the convenience of medical personnel in producing medical records. However, recent speech recognition services and research have improved the convenience of typing beyond simple user interface through natural dialogue with users. In addition, it has become possible to manage customer's health, such as checking and improving their health status.

This Recommendation proposes a service model through the speech recognition interface in human-care services such as healthcare fields using several scenarios to apply speech recognition technology.

- **Recommendation ITU-T H.862.0 "Requirements and framework for ICT sleep management service models":** Sleep could affect labour productivity, healthcare in many fields of human factors. While previous sleep management markets focused on furniture including bedding and medical sleep management, current trends include a new form of sleep management technology, including a convergence of existing sleep management methodology and ICT. The purpose of this Recommendation is to define requirements and framework for ICT sleep management services. The scope of this Recommendation is focused on the reference model of the sleep management service and introduces sleep safety services and sleep quality improvement services. Solutions exist for sleep monitoring and sleep status check services that use a variety of sensors and technologies. While they lead to quantitative expansion of sleep management services, they are difficult to integrate into one service due to the different sleep visualization methods that vary across different service devices. To address these challenges, the task will propose approaches to ensure interoperability by expressing various types of sleep data in an integrated process. This Recommendation defines a service model and requirements concerning sleep monitoring and sleep status check services to ensure interoperability of sleep management services.

217. ITU-T SG20 under Q3/20 "Architectures, management, protocols and Quality of Service" is working on draft Recommendation ITU-T Y.cnce-IoT-arch "Functional architecture of cellular-radio network capability exposure for smart hospital based on Internet of things" and under Q4/20 "e/Smart services, applications and supporting platforms" is working on draft Recommendation ITU-T Y.eHealth-Semantic "Framework to support semantic mediation of eHealth services". Additionally, Q7/20 "Evaluation and assessment of Smart Sustainable Cities and Communities" developed:

    - **Recommendation ITU-T Y.4908 "Performance evaluation frameworks of e-health systems in the IoT" (under approval)**: Currently e-health systems are being implemented by governments and stakeholders to increase the effectiveness, efficiency and the quality of health care services. The Internet of things (IoT) as a relatively new technology is transforming e-health systems to further enhance health care services. However, this transformation concomitantly creates a need for effective performance evaluation frameworks of e-health systems in the IoT. This

Recommendation addresses this need for effective performance evaluation frameworks of e-health systems in the IoT and includes:

– A classification of e-health services in the IoT

– A non-exhaustive set of non-functional performance evaluation factors applicable to the e-health systems in the IoT

– Performance evaluation frameworks for e-health systems in the IoT.

218. 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.

219. 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).

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

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 (13.1. 13.3). SDG 17

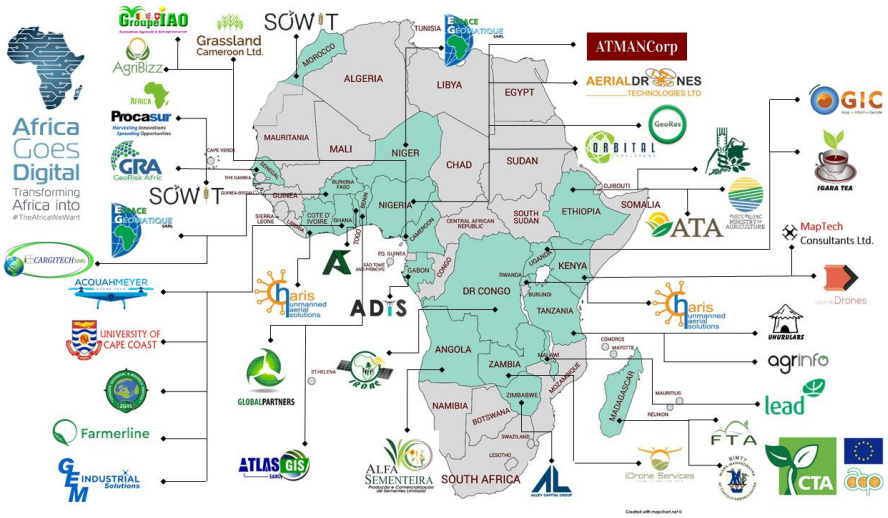
221. The Action line C7 E-Agriculture Facilitation meeting was held jointly by ITU and the Food and Agriculture Organization (FAO) entitled "Fostering an Enabling Ecosystem for Food and Agriculture through Digital Innovation" on Friday, 21 August 2020. E-Agriculture specifically involves the conceptualization, design, development, evaluation and application of innovative tools and mechanisms to use information and communication technologies (ICT) in the rural sector, with a primary focus on agriculture. The session proposed a framework for systematically integrating e-Agriculture at the national level through the creation of a digital innovation ecosystem that would support and foster further the creation and adequate use of ICTs to empower smallholder and family farmers and consequently improve productivity in food systems as a whole and worldwide, reaching the most vulnerable. More details on the session here.

222. The major achievements are the following: FAO's International Platform for Digital Food and Agriculture to enhance awareness on issues specific to the digitalization of the food

and agriculture sectors and provide policy recommendations to governments to support decision-making at higher levels; the Hand-in-Hand initiative to accelerate agricultural transformation and sustainable rural development to eradicate poverty (SDG1) and end hunger and all forms of malnutrition (SDG2); the Hand-in-Hand Geospatial Platform to support all stakeholders with rich, shareable data while respecting the proper protocols of data confidentiality; Digital Agriculture and Innovation Hubs to enhance innovation ecosystem and culture; the partnership with Zhejiang University to establish a Centre of Excellence for Youth Innovation and Entrepreneurship and the FAO-ITU national e-agriculture strategy that aims at supporting governments in optimizing resources for the development of the agri-food sector in the process of digital transformation and implementing "smart villages"to empower rural smallholders and family farmers.

223. Digital innovation has revealed to have a true potential to transform the approach to all 17 SDGs. Specifically, the development of a strategic framework for digital innovation in the food and agriculture sector will provide a systematic process and sustainable business model for creating, testing, funding, and scaling new digital solutions to achieve several SDGs, particularly 1 (eradication of poverty), 2 (end hunger), 8 (decent work and economic growth), and 13 (climate action). This session also focused on youth entrepreneurship, capacity development and multi-stakeholder partnerships, which are key enablers to establish business models to produce new ideas and products, shape better policy recommendations, better use of data, better knowledge transferring, and better digital solutions aimed at contributing and achieving all the SDGs.

224. The WSIS Prizes 2020 Winner in category e-Agriculture is the Eyes in the Sky, Smart Techs on the Ground, Technical Centre for Agricultural and Rural Cooperation ACP EU, Netherlands.



By embodying components like scientific research, proof of concept initiatives, capacity building, support to investment, enterprise development, networking, experience capitalisation & communication, this project has started transforming Africa's agriculture into a high-tech industry, with decisions being based on real-time gathering and processing of data, productivity & yields.

The establishment of 38 rapidly expanding, youth-led enterprises offering drone-based services in 21 African countries, represents a significant development for the continent & a

milestone for the building of the African Information Society. Started at the end of 2016, this project caught the attention of young entrepreneurs who were selected via a competitive processes, trained, & technically & financially supported in offering drone-based services to farmers' organisations, agribusinesses, government, international development agencies & other parties. A June 2019 survey confirmed that the enterprises have been recruiting staff, investing in new equipment, increasing their turnover and client portfolio. An industry association (Africa Goes Digital Inc) as been established to support further growth of the enterprises and enable members to group, offer diverse services & be more competitive. The project played an important role in establishing an enabling environment for the technology. It supported the African Union's appointed High Level African Panel on Emerging Techs in selecting "drones for precision agriculture" as one of the most promising technologies which would foster Africa's development. In Jan 2018 the AU Executive Council recommended that all Member States harness the opportunities offered by drones for agriculture. A full report entitled "Drones on the horizon: Transforming Africa's Agriculture" was launched at the Africa Innovation Summit in Kigali (6/6/18). Project implementers co-authored the report & have been advising national civil aviation authorities in developing regulations for the responsible use of drones.

Project website

https://www.cta.int/en/projects/eyes-in-the-sky

Sustainable development goals related to this project

- Goal 2: Zero hunger
- Goal 8: Decent work and economic growth
- Goal 13: Climate action

Target beneficiary group(s)

- Youth
- Small-scale farmers

225. 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.

226. 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.

227. ITU-T Study Group 20 within Q4/20 on "e/Smart services, applications and supporting platforms" has developed **Recommendation ITU-T Y.4466 on "Framework of Smart Greenhouse service"**. Smart greenhouse is an IoT-based approach toward food production. The goal of smart greenhouse is to provide and maintain optimal conditions for growing crops in greenhouse environment; the optimal growth conditions can be automatically adjusted with help of a number of sensors and actuators.

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

228. The Action Line C7: E-Environment Facilitation meeting was held on Monday, 27 July 2020 as an integral component of the WSIS Forum 2020. It was co-organized by WMO and ITU. The session addressed how ICT and education can provide innovative solutions for climate action. More details on this session here.

229. This session was mainly linked to the following SDGs: SDG 4, 13 and 17.

230. The WSIS Prizes 2020 Winner for the Action Line C7 on E-Environment is the China Unicom "Smart Blue" public service big data platform, Network Intelligent Operation Research Center of China Unicom Research Institute, China.

As one of the world's largest telecom operators, China Unicom provides services to billions of mobile subscribers. Therefore, China Unicom has a large amount of telecom big data, which contains rich network and user information.

In order to give full play to the value of big data, and better protect the environment and better implement WSIS Action Lines in order to promote the realization of SDGs, the “Smart Blue” public service big data platform was proposed, which is a cross-industry integration platform for environmental protection.

China Unicom “Smart Blue” public service big data platform is dedicated to improving the application of big data technology. It positively integrates telecom big data with air quality data, population data, and behavior data for the first time to achieve refined air quality prediction and pollution traceability. Aiming at the key pollution areas, the platform can realize the functions of people flow and vehicle disintegration early warning so as to alleviate air pollution. What is more, the platform can rack pollution discharges, assess the impact on resident residents and enterprises, and provide support and reference for government guidance and decision-making. The project is also proved to have the transplant ability, which can be applied in other fields and different communities as it provides a technological model and architecture.

Project website

http://www.chinaunicom.com.cn/

Sustainable development goals related to this project

- Goal 3: Good health and well-being
- Goal 5: Gender equality
- Goal 8: Decent work and economic growth
- Goal 9: Industry, innovation and infrastructure
- Goal 11: Sustainable cities and communities
- Goal 13: Climate action

Target beneficiary group(s)

- Youth
- Older persons

- Women
- People with disabilities
- Remote and rural communities

231. The Development sector of the ITU has undertaken several activities falling under the Action Line c7 e- environment, in particular Emergency Telecommunications, E-waste, Climate change, Disaster risk management and so on:

1) Emergency Telecommunications:

a. BDT deployed emergency telecommunications equipment to the following countries: Haiti and Zimbabwe. The equipment included satellite mobile phones, broadband global area network (BGAN) terminals, laptops, and solar panels for charging the equipment. Training on the use of the equipment was also provided to staff designated by the respective governments.
b. Early warning systems (EWS): Final implementation of the EWS for Zambia
c. Movable and Deployable Units Project is ongoing.
d. A new Cooperation Agreement was signed between ITU and Ultisat pertaining the donation of Two (2) complete fixed VSAT systems including free satellite connectivity for 6 months after installation as well as end-to-end managed services.
e. Ongoing implementation of the ITU Big Data Project for mitigating epidemics. This project involves three countries, Sierra Leone, Guinea and Liberia.
f. Development of the Second Multi-stakeholder Forum on the Role of Telecommunication/ICTs for Disaster Management for the Americas Region, that took place in Bogotá, Colombia from 29 to 31 August 2017. This event builds on the first Forum that took place in Bogotá, Colombia in July 2012. The 2017 event was attended by over 300 participants from different countries in the Region as well as different UN organizations, private sector entities, NGO's, academia and other humanitarian organizations.
g. Development of the ITU-GSMA Regional Training Workshop on ICTs for Disasters Management for Arab States; Khartoum, Sudan 28-29 August 2017.
h. In the 2017-2021 study period this topic is addressed by ITU-D Study Group 2 Question 5/2: Utilizing telecommunications/ICTs for disaster risk reduction and management. Related topical reports are available in the six official languages, with the most recent one being the final report from the 2014-2017 study period on "Utilization of telecommunications/ICTs for disaster preparedness, mitigation and response" available at the following link.

2) E-waste:

a. The e-waste management policy and regulatory framework for Saint Lucia was finalized.
b. The project for the establishment of an e-waste plant to assist Argentina at the University of La Plata is under closing.
c. A handbook on e-waste policies and legislative frameworks for ICT generated e-waste was published in 2018.
d. During the WSIS Forum 2017, BDT organized a session on 'Addressing the Global e-waste Challenge', to highlight current challenges in the area of e-waste, discuss measurement issues and to introduce the Global E-waste Statistics Partnership.

e. In 2017, ITU, in cooperation with the United Nations University (UNU) and the Solid Waste Association (ISWA), launched the Global E-waste Statistics Partnership (GESP). Its main objectives are to improve and collect worldwide e-waste statistics, and to publish these in the Global and Regional E-waste Monitors. The Partnership raises visibility about the importance of tracking e-waste and delivers capacity building workshops.
f. In the 2017-2021 study period this topic is addressed by ITU-D Study Group 2 Question 6/2: ICTs and the environment. The final report from the 2014-2017 study period on "Strategies and policies for the proper disposal or reuse of telecommunication/ICT waste material" was finalised and published.
g. At WSIS 2018, ITU and the UN E-waste Coalition organised a high-level dialogue on "An End to Electronic Waste" where a Letter of Intent (LoI) was signed by seven UN entities.
h. In 2019, the UN E-waste Coalition and the World Economic Forum launched a report *A New Circular Vision for Electronics* which makes the case for circularity in the electronics sector.
i. The LoI which sees the UN strengthening its commitment towards UN system-wide collaboration on tackling e-waste was signed by a further three UN entities at WSIS 2019.
j. In 2019, ITU and its GESP partners launched the open-source globalewaste.org website which stores the world's data and statistics on e-waste.
k. In collaboration with its GESP partners, ITU has been delivering regional e-waste statistics workshops both through its headquarters and its regional offices.
l. ITU has begun providing concentrated assistance to its member states, in the development of national e-waste management policies and bringing various line ministries together on this.

3) Climate Change:

a. Within the ITU Academy, BDT is finalizing standardized training materials for a full training program on ICTs and Climate Change. Capacity Building efforts will be based on this material. Contributions by relevant experts in ITU-T have enriched the preparation of these modules. A number of academic institutions are also contributed and supported the editing of materials developed. ITU Centres of Excellence and other partners will also benefit from these materials.
b. gathering and reporting much needed for both climate change adaptation and mitigation.
c. BDT participated and contributed to the organization of the International Conference on Early Warning Systems that was held in Cancun, Mexico, in May 2017. The following organizations were also part of organizers of : WMO, UNISDR, UNICEF, UNOCHA, among others.
d. In the 2017-2021 study period this topic is addressed by ITU-D Study Group 2 Question 6/2: ICTs and the environment. The final report from the 2014-2017 study period on "ICT and climate change" is available at the following link.

232. The Standardization sector of the ITU has undertaken several activities falling under the **action** line c7 e- environment, 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.

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

- Webinar on "Smart sustainable cities and frontier technologies in Latin America", Virtual, 8 December 2020
- "Session on: "Using international standards to build smart sustainable cities and tackle climate change, e-waste and nature loss", Virtual, 15 October 2020
- Webinar on "Accelerating cities' transformation through standards", Virtual, 25 June 2020
- Webinar: Explore a circular vision for the ICT sector, 16 April 2020, 16:00 hours, Geneva time
- Webinar: Explore a circular vision for the ICT sector, 14 April 2020, 10:00 hours, Geneva time
- Webinar: Using international standards to tackle the e-waste challenge, 2 April 2020, 16:00 hours,
- Webinar: Using international standards to tackle the e-waste challenge, 1 April 2020, 10:00 hours, Geneva time
- ITU Forum "Smart sustainable cities: from concept to implementation", 3-5 March 2020, Minsk, Belarus
  WUF10 Networking event on "Governing and managing smart sustainable cities", 10 February 2020, Abu Dhabi, UAE
- 1st Meeting of the ITU-T Focus Group on Environmental Efficiency for Artificial Intelligence and other Emerging Technologies (FG-AI4EE), 12 December 2019, Vienna, Austria
- 5th ITU Workshop on Data Processing and Management for IoT and Smart Cities & Communities, 25 November 2019, Geneva
- World Cities Day - Session on "Smart and sustainable cities: Changing the world: innovations and better life for future generations", 31 October 2019 (15h00-16h30), New York, UNHQ

– Themed "Connecting Smart Sustainable Cities with the Sustainable Development Goals", the 9th Green Standards Week (GSW-19) was held in Valencia, Spain, 1-4 October 2019, organized by ITU together with 37 partners and hosted by the city of Valencia. GSW-19 concluded with the adoption of a Call to Action to accelerate the transition to Smart Sustainable Cities. The Green Standards Week has the following structure:

  - **Day 1 - Tuesday, 1 October 2019**
    - Leadership Panel on "Connecting Smart Sustainable Cities with the Sustainable Development Goals"
    - U4SSC Award Ceremony & Photo Session
    - Forum on "Frontier Technologies to Tackle Climate Change and Achieve a Circular Economy"
  - **Day 2 - Wednesday, 2 October 2019**
    - Forum on "Smart Governance in Cities"
    - Valencia: Smart City
  - **Day 3 - Thursday, 3 October 2019**
    - 4th meeting of the United for Smart Sustainable Cities Initiative (U4SSC)
    - Meeting of the Spanish Expert Committee on Smart Sustainable Cities - *by invitation only*
  - **Day 4 - Friday, 4 October 2019**
    - Training on Building Smarter and More Sustainable Cities

- 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.

234. **International Standards**

- ITU-T Study Group 5 on Environment, Climate Change and Circular Economy is responsible for studying ICT environmental aspects of electromagnetic phenomena and climate change. SG5 also studies issues related to resistibility, human exposure to electromagnetic fields, circular economy, energy efficiency and climate change adaptation and mitigation .Under its environmental mandate SG5 is also responsible for studying design methodologies to reduce ICTs and e-waste's adverse environmental effects, for example, through recycling of ICT facilities and equipment. ITU-T SG5 is the lead study group on electromagnetic compatibility, lightning protection and electromagnetic effects; ICTs related to the environment, climate change, energy efficiency and clean energy and circular economy, including e waste.
- 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. A number of new green ICT standards in the ITU-T L.1000, 1100, 1200 and 1300 series of Recommendations enable energy efficient ICT/telecommunication solutions. For example:
  - ITU-T Study Group 5 on Environment and Climate is responsible for studies on methodologies for evaluating ICT effects on climate change and publishing guidelines for using ICTs in an eco-friendly way. Under its environmental mandate SG5 is also responsible for studying design methodologies to reduce ICTs and e-waste's adverse environmental effects, for example, through recycling of ICT facilities and equipment.

- 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. A number of new green ICT standards in the ITU-T L.1300 series of Recommendations enable energy efficient ICT/telecommunication solutions.

- The following Recommendations and Supplements have been approved:
  - **Recommendation ITU-T L.1023 "Assessment method for Circular Scoring"** outlines an assessment methodology for circularity scoring of ICT goods. The assessment method consist of three steps:

    1) Setting the relevance and applicability (*R*) of each criterion for circular product design (*Criterion, Criteria, CCPD*) for the ICT good at hand,

    2) Assess the margin of improvement (*MI*) of each *Criterion*,

    3) Calculate the circularity score (*Score*) from 0 to 100 % for the ICT good at hand for all three Circular Design Guideline Groups (*Groups, CDGGs*). This includes:

    - Using a predefined value matrix to identify the % score from 0 to 100 for each combination of *R×MI*.

- Average the included *Criteria* for the ICT good at hand separately for all three *Groups:* Product Durability, Ability to Recycle, Repair, Reuse, and Upgrade from equipment and manufacturer level.

- **Recommendation ITU-T L.1310 (revised) "Energy efficiency metrics and measurement methods for telecommunication equipment"** contains the definition of energy efficiency metrics test procedures, methodologies and measurement profiles required to assess the energy efficiency of telecommunication equipment. Energy efficiency metrics and measurement methods are defined for telecommunication network equipment and small networking equipment. These metrics allow for the comparison of equipment within the same class, e.g., equipment using the same technologies. The comparison of equipment in different classes is out of the scope of this Recommendation.

- **Recommendation 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.

- **Recommendation ITU-T L.1371 "A methodology for assessing and scoring the sustainability performance of office buildings"** provides a consistent framework for building owners, managers and operators to critically assess, score and improve the sustainability performance of office buildings in ten key areas; Energy, Water, Air, Comfort, Health & Wellness, Purchasing, Custodial, Waste, Site, and Stakeholders. The framework described in this Recommendation provides a set concrete and measurable steps to reduce the environmental impacts, and specifically the Greenhouse Gas emissions, of existing office buildings, thus contributing to the achievement of the Sustainable Development Goal 11 'Make cities and human settlements inclusive, safe, resilient and sustainable'. The Annex to this Recommendation specifically contains an assessment scoring methodology to allow owners and managers to undertake a self assessment to evaluate their building's current status and track progress going forward.

- **Recommendation ITU-T L.1381 "Smart energy solution for data centre"**: The smart control strategy on whole data centre energy system including the different power feeding solutions and cooling solutions are considered to get the higher energy efficiency and decrease the whole energy consumption. Firstly, for multiple energy input system, PV, wind, fuel cells, the grid, power generator and batteries were connected to the system. How to control these different energy inputs in smart way to increase the energy efficiency and also decrease the carbon emission will be considered in this Recommendation. In addition, for smart cooling

system, how to use the outside cool air and maximize utilization of ICT side cooling such as ICT rack cooling, row cooling methods and liquid cooling etc. This Recommendation focuses on smart energy solutions for data centre to achieve green and sustainable goals including environmental friendly, decreasing carbon emissions, increasing energy efficiency and extending product life etc.

- **Recommendation ITU-T L.1382 "Smart energy solution for telecommunication rooms"** provides requirements on the power supply mode of the three-layer architecture of the telecommunication rooms. It aims to drive future-oriented network deployment for the ICT industry, maximize the energy efficiency , the use of renewable resources, and social resources in the digital era, and reduce energy and resource consumption while ensuring network performance and user experience, innovative ICT technologies are used to promote network energy saving, emission reduction, circular economy development, and continuously drive all parties in the industry chain to jointly build green networks and low-carbon societies. In addition, this standard provides suggestions and requirements on the deployment of three types of telecommunication rooms, which can be used as a reference for telecom operators to build the target network evolution strategies for telecommunication room power supply. This standard accelerates network deployment, reduces CAPEX and OPEX, optimizes investment efficiency, and guides ICT industry transformation and optimization. The new networking architecture, new power supply technologies, and specifications mentioned in this document will also effectively promote the upgrade of industry technologies.
- **ITU-T L.Suppl.37 "Guidance to operators of mobile networks, fixed networks and data-centres on setting 1.5°C aligned targets compliant with Recommendation ITU-T L.1470"** supports information and communication technology (ICTs) organizations in setting science-based targets for greenhouse gases (GHGs) according to the decarbonisation pathways, described in detail in Recommendation ITU-T L.1470 'GHG emissions trajectories for the ICT sector compatible with the UNFCCC (United Nations Framework Convention on Climate Change) Paris Agreement', aligned to the IPCC Special Report on 1.5°C and developed to be used as a sectoral target-setting approach by the Science Based Targets Initiative (SBTi). This supplement focuses exclusively on ICT organizations operating mobile networks, fixed networks and/or data centres. Guidance for further ICT sub-sectors will be covered separately.

– 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:
  - **Recommendation ITU-T L.1210 "Sustainable power-feeding solutions for 5G networks"** defines power-feeding solutions for 5G, converged wireless and wireline access equipment and networks, taking into consideration their enhanced requirements on service availability and reliability, new deployment scenarios, along with the environmental impact of the proposed solutions. The minimum requirements of different solutions, including power-feeding structures, components, backup, safety requirements and environmental conditions, are also

defined. This Recommendation is applicable to the powering of both mobile and fixed access network elements, in particular equipment that have similar configurations and needs. For example: ITU standards to assist in the responsible management of electromagnetic fields include measuring techniques, procedures and numerical models for evaluating the electromagnetic fields stemming from telecommunication systems and radio terminals. Several new and revised standards in the ITU-T K-series of Recommendations provide EMC resistibility and safety limits of ICT equipment and infrastructure, and thereby contribute to the SDG goal 9.

- **Recommendation ITU-T K.20 (revised) "Resistibility of telecommunication equipment installed in a telecommunication centre to overvoltages and overcurrents"** specifies resistibility requirements and test procedures for telecommunication equipment that is attached to or installed within a telecommunication centre. Overvoltages and overcurrents covered by this Recommendation include surges due to lightning on or near the line plant, short term induction from adjacent 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, between equipment or racks, are mainly inductive coupling caused by lightning currents being conducted in nearby lightning strikes or lightning currents being conducted in nearby conductors.

  Major changes compared with Recommendation ITU-T K.20 (2017) include:

  - DC insulation resistance test;
  - revised test exemption for internal short cables;
  - renaming of some test titles for clarity;
  - screened cable exemptions;
  - addition of Test 7.10, a twisted pair port transverse/differential test, to Table 7.

- **Recommendation ITU-T K.21 (2019) Amd.1 "Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents – Amendment 1: Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents"** refers to Annex A. Annex A applies to special environments, one factor being that the primary protection has a poor earth connection that does not meet the requirements of Recommendation ITU-T K.66. This condition is simulated by increasing the STP earth resistance (R1) from zero to 100. People have missed this change, possibly because the test circuit diagram is in Recommendation ITU-T K.44. To alert readers of this a text note has been inserted in the Comments column.

- **Recommendation ITU-T K.39 (revised) "Risk assessment of damages to telecommunication sites due to lightning discharges":** Protective measures against a randomly occurring overvoltage phenomenon like lightning discharges have to a great extent been empirically based. Modern equipment has shown to be more prone to damages compared with older ones. Serious consequences in

complexed communication systems may also occur in built-up areas, earlier classified as unexposed. The widespread use of radio stations with high antenna masts for wireless telecommunication has significantly increased the risk for damages due to direct lightning strikes to the site. The need for protection should be based on a risk assessment considering the cost and importance of the system, the electromagnetic environment at the particular site and the probability of damages. The protection levels and the type of protective methods should also be chosen regarding the costs of installation and maintenance of protective devices. An assessment of the probability of overvoltage occurrences and the sensitivity of the existing telecommunication installation shall give a possibility to attain a well-balanced protection of the whole system. Protective measures to eliminate severe injuries to people during thunderstorms are especially important at exposed sites that are permanently or temporarily manned.

- **Recommendation ITU-T K.40 (revised) "Protection against lightning electromagnetic pulses in telecommunication centres":** Guidelines for the design of an effective protective system for a telecommunication structure against lightning electromagnetic pulse (LEMP) are proposed. The concept of lightning protection zones is introduced as a framework where specific protective measures are merged: earthing, bonding, cable routing, shielding, coordinated SPD system and isolating interfaces. Information about simulating the LEMP effects and a shopping list for the protective measures in existing and new buildings are also given.
- **Recommendation ITU-T K.44 (revised) "Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents – Basic Recommendation"** seeks to establish fundamental test methods and criteria for the resistibility of telecommunication equipment to overvoltages and overcurrents. Overvoltages or overcurrents covered by this Recommendation include surges due to lightning on or near the line plant, short-term induction of alternating voltages from adjacent electric power lines or electrified railway systems, earth potential rise due to power faults and direct contacts between telecommunication lines and power lines.

  Major changes compared with the 2018 version of this Recommendation include:

  - Appendices I and II removed and made into K.44 Supplements;
  - New twisted pair transverse/differential surge test circuit;
  - added Ethernet insulation resistance test to avoid port power cross test;
  - revision of the test schematics to improve clarity.
- **Recommendation ITU-T K.45 (revised) "Resistibility of telecommunication equipment installed in the access and trunk networks to overvoltages and overcurrents"** specifies resistibility requirements and test procedures for telecommunication equipment installed between telecommunication centres and between a telecommunication centre and the 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 AC power lines or

railway systems, earth potential rise due to power faults, direct contact between telecommunication lines and power lines and electrostatic discharges.

Changes compared with Recommendation ITU-T K.45 (2018) include:

- DC insulation resistance test;
- Special requirements Annex.

- **Recommendation ITU-T K.45 (2019) Amd.1 "Resistibility of telecommunication equipment installed in the access and trunk networks to overvoltages and overcurrents – Amendment 1: Resistibility of telecommunication equipment installed in the access and trunk networks to overvoltages and overcurrents"** refers to Annex A. Annex A applies to special environments, one factor being that the primary protection has a poor earth connection that does not meet the requirements of Recommendation ITU-T K.66. This condition is simulated by increasing the STP earth resistance (R1) from zero to 100. People have missed this change, possibly because the test circuit diagram is in Recommendation ITU-T K.44. To alert readers of this a text note has been inserted in the Comments column.
- **Recommendation ITU-T K.50 (2018) Amd.1 "Safe limits for operating voltages and currents in telecommunication systems powered over the network Amendment 1: Safe limits for operating voltages and currents of telecommunication systems powered over the network"** updates Figure 3 to refer to ITU-T K.50 clauses rather than IEC 60950-1 clauses.
- **Recommendation ITU-T K.56 (revised) "Protection of radio base stations against lightning discharges" (under approval)** presents the techniques applied to a telecommunication radio base station in order to protect it against lightning discharges. The need of protection is obtained from the methodology contained in IEC 62305-2, which is used to determine the relevant lightning protection level (LPL) for the installation. The protection techniques for the external area cover the lightning protection system (LPS), bonding procedures, earthing and the installation of surge protective devices (SPDs) at the power meter station. The protection techniques for the equipment building cover the feeder and lighting cables, the electric power conductors, the telecommunication cabling and the earthing/bonding procedures applied to cable trays and equipment frames. This Recommendation also provides guidelines in order to achieve adequate protection of the telecommunication equipment based on the coordination between equipment resistibility, SPD protection level and installation characteristics.
- **Recommendation ITU-T K.64 (revised) "Safe working practices for outside equipment installed in particular environments"** describes working practices for service personnel to help them work safely in telecommunication installations in three specific environments. The specific environments covered in this Recommendation are characterized by wet conditions or close proximity to exposed metallic parts. The working practices apply to telecommunication plants with voltage levels higher than the limits defined for analogue PSTN circuits, such as remote feeding telecommunication current or voltage (RFT-C or RFT-V) circuits. This version of Recommendation ITU-T K.64 includes a warning regarding contact

with terminals carrying RFT circuits with small parts of the body, e.g., back of the hand. The references have been updated to include the IEC 62368 series.

- **Recommendation ITU-T K.66 (revised)"Protection of customer premises from overvoltages"** provides Recommendations for bonding and earthing of telecommunication equipment in residential and commercial customer premises;
  - refers to Recommendation ITU-T K.21 (2008) for equipment resistibility requirements;
  - recommends earthing and bonding requirements to coordinate with the resistibility requirements of Recommendation ITU-T K.21 (2008) and the safety requirements of IEC 60950-1 and IEC 62368;
  - recommends the installation practices for bonding of all services and the installation of surge protective devices (SPDs);
  - illustrates problems associated with earthing and bonding and provides solutions for these earthing and bonding problems. These include:
    1) methods to improve the earthing and bonding;
    2) methods of providing additional protection external to the equipment;
    3) special resistibility and safety requirements;
  - recommends responsibilities for protection at customer premises;
  - refers to IEC 62305-3 for protection against direct lightning.

  This revision of Recommendation ITU-T K.66 includes an update of the references and a revision of clause 6.3 to include more information on preventing equipment damage. Appendix IV, containing information on special resistibility requirements has been deleted; the reader is directed to Recommendation ITU T K.44 (2008).

- **Recommendation ITU-T K.73 (revised) "Shielding and bonding for cables between buildings"**: Bonding and earthing of telecommunication installations is done for reliability and personnel safety reasons. The evolution of the power architecture of telecommunication systems has created new installation conditions for equipment. To cover these situations, bonding and earthing configurations need to be defined to ensure that adequate reliability and safety are maintained. Recommendation ITU-T K.73 analyses the situation in which equipment, connected together, is installed in different buildings with different earthing and power feeding conditions. This Recommendation also includes installation requirements for equipment located in different buildings, having the same earthing and feeding power conditions, to improve the shielding and bonding of telecommunication and power cable between buildings.

  Other Recommendations dealing with bonding and earthing are Recommendation ITU-T K.27, Bonding configurations and earthing inside a telecommunication building, Recommendation ITU T K.35, Bonding configurations and earthing at remote electronic sites and Recommendation ITU T K.66, Protection of customer

premises from overvoltages. These Recommendations do not cover how equipment installed in these different environments can be interconnected.

- **Recommendation 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.
- **Recommendation ITU-T K.91 (revised) "Guidance for assessment, evaluation and monitoring of human exposure to radio frequency electromagnetic fields"** are many possible methods of exposure assessment and each of them has its own advantages and disadvantages. Draft revised 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 9 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.
- **Recommendation ITU-T K.112 (revised) "Lightning protection, earthing and bonding: Practical procedures for radio base stations" (under approval)** provides a set of practical procedures related to the lightning protection, earthing and bonding of a radio base station (RBS). It considers two types of RBS: those that are stand-alone installations, comprising a tower and the associated equipment and those that are installed on the roof of a building. In both cases, this Recommendation provides the procedures for the design and installation of the lightning air-termination system, down-conductors, earthing network, bonding conductors and surge protective devices (SPDs). This includes the specification of the materials, anti corrosion protection and special treatment for rocky areas. Particular attention is directed to the protection of the navigation light systems and of the electric power conductors that feed the RBS, especially in the case where the RBS is installed on the roof of a building. Annex A presents practical examples of earthing network design, whereas Annex B presents an overview of the techniques for measuring the earthing resistance and the earth resistivity.
- **Recommendation ITU-T K.142 "Lightning protection and earthing of video surveillance system"** provides a set of practical procedures related to the lightning protection, earthing and bonding of a Video Surveillance System (VSS). The main objective of this Recommendation is to reduce risk of damage to VSS due to lightning flashes, which will improve the safety and reliability of the VSS itself and its related equipment. This Recommendation also provides the configuration and rating of protection modules required to protect VSS against lightning surges.

Usually Video Surveillance System can be used to remotely capture multimedia (such as audio, video, image, alarm signal, etc.) and present them to the end user in a user-friendly manner, based on a managed broadband network with ensured quality, security and reliability. According the type of signal transmitted, the system can be divided into three kinds: analogue; Semi digital-semi analogue; full digital video surveillance system (also be called IP based system); because IP based system are more complicated for lightning protection, IP-Camera systems are not included in this Recommendation. The related scope can be referred to ITU-T K.45.

Annex A presents classification of Video Surveillance System, whereas Appendix I presents an overview of practical procedures of earthing for VSS's front-end equipment.

Related technical requirements have been adopted in many surveillance products, effectively improved the lightning protection ability and usage of related products, guaranteed network operate normally.

- **Recommendation ITU-T K.143 "Guidance on safety relating to the use of surge protective devices and surge protective components in telecommunication terminal equipment":** Requirement on bridging between primary circuit and protective earth by SPD in equipment is described in clause 5.5.7 of [IEC 62368-1]. However the standard does not take into consideration the lightning voltage which is larger than that appears in the conditions considered in overvoltage category II, and it does not provide the requirements necessary for lightning protection of class II equipment without earthing in which bridging by SPD/SPCs is usually applied. It is necessary to clarify the electrical requirements for SPDs/SPCs in order to realize both resistibility and safety of telecommunication systems. This Recommendation analyses the influence on human safety of lightning measures bridging across insulation by SPDs. This Recommendation provides guidance for design of lightning protection and requirements of SPDs from the human safety standpoint. The requirements on SPDs/SPCs in MSPD (multi-service SPD) external to the equipment and SPDs installed on lines in a building are not within the scope of this Recommendation.
- **Recommendation ITU-T K.144 "Surge protective component application guide - Self-restoring thermally activated overcurrent protectors"**: Unlike fuses and heat coils, which break the circuit, these series connected self-restoring thermally activated overcurrent protectors (OCPs) automatically reset when the electrical event causing the overcurrent stops, without the need for manual intervention. Self-restoring thermally activated overcurrent protector (OCP) components operate by the increasing in resistance value, which reduces the circuit current when the overcurrent exceeds a given value for a sufficient time. The resistance transition is caused by the component body reaching a critical temperature caused by the i2R heating of the overcurrent flowing through the component. The generic name for components with this type of action is positive temperature coefficient (PTC) thermistors. Being thermally operated, these PTC thermistors generally do not operate for short duration electrical transients, such as coupled lightning currents, but will operate for longer term AC and DC overcurrents. There are two types of material used to make PTC thermistors; ceramic and polymer. Many of the component parameters apply to the both types of material. Some

parameters are specific to the material used and these differences are explained. This Recommendation describes PTC thermistor construction, operation, production, ratings, characteristics and gives application examples.

- **Recommendation ITU-T K.145 "Assessment and management of compliance with RF EMF exposure limits for workers at radiocommunication sites and facilities"** includes guidance on the protection of workers against radio frequency electromagnetic fields (RF-EMF) exposure in their working environment. RF workers range from installation engineers and tower climbers to R&D personnel and laboratory testing engineers. All of them are exposed to stronger RF-EMF fields than the general public. There also RF informed workers who have been provided with information on RF-EMF safe working practices for a site and all other workers who are regarded as members of the public for the purposes on RF-EMF exposure limits. In this Recommendation there is created minimum common safety guidance for telecommunication RF workers around the world.
- **Recommendation ITU-T K.146 "Management of interferences on telecommunication transmissions on copper other than speech"** deals with the management of electromagnetic interference produced by electrified railways traction systems on telecommunication systems in DSL frequency band. This Recommendation defines only a procedure to evaluate the acceptability of an electromagnetic DSL draft interference and gives:

  – the criteria defining the Quality of Service that has to be reached;

  – the limits of the commercial ADSL offer guaranteed by an Internet Service Provider in conjunction with a telecom operator if necessary, in the vicinity of potential disturbing railway;

  – the installation conditions of electrified traction and telecommunication systems under which the recommendation applies.

  This Recommendation helps to establish a contract between Internet Service Providers in conjunction with telecommunication operators if necessary and railway operators in order to clearly share responsibilities, and, as a consequence, if necessary, the relevant expenses for mitigation measures.
- **Recommendation ITU-T K.147 "Ethernet port resistibility testing for overvoltages and overcurrents":** Ethernet, using twisted pair cabling, is a ubiquitous communications link, which also can act as a powering feed. Usually Ethernet is implemented as a star network and terminal ports can be independently tested for resistibility. Where equipment has multiple independent Ethernet 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 network by magnetic induction, earth potential rise, resistive coupling and transient coupling by 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 AC mains power faults to couple into the network. This Recommendation covers the different "IEEE 802.3 Ethernet" 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.Suppl.1 (revised) – "ITU-T K.91 – Guide on electromagnetic fields and health"**: The objective of Supplement 1 to the ITU-T K-series Recommendations, Guide on electromagnetic fields and health, is to answer questions commonly posed by the public on EMF and to address related concerns. This Guide on electromagnetic fields and health aims to:

  • Provide electromagnetic field (EMF) information and education resources suitable for all communities, stakeholders and governments.

  • Support clarification of the science by referencing the WHO and other stakeholders (see Note) that provide information that is particularly useful in helping to clarify scientific uncertainties e.g., in the areas of radio frequency (RF) technology, infrastructure implementation, usage and consequential EMF exposure.

  NOTE – The primary reference on EMF and health is the World Health Organization (WHO). The primary reference on EMF assessment methods is the International Telecommunication Union (ITU) and the International Electrotechnical Commission (IEC).

- **ITU-T K.Suppl.20 "RF Exposure evaluation around base station installed underground"**: Measurement and computation methods of human exposure to electromagnetic fields (EMFs) from fixed radio sources like mobile base stations have been standardized and published as ITU-T K-series Recommendations and IEC 62232. These also includes these methods prescribed in Japanese regulation, and have been basically assumed to be applied to radio sources installed above the ground. Underground base stations for use in small cells of fourth generation (4G) mobile networks are installed underground to construct service areas above the ground. Supplement <No.> to ITU-T K-series Recommendations contains the measurement results of radio frequency exposure from underground base stations, in order to evaluate the exposure from these base stations.

- 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 set of 24 technical reports and technical specifications to address the environmental efficiency, as well as water and energy consumption of emerging technologies.
  - A Global Portal on ICTs, Environment, Climate Change and Circular Economy is being maintained and provides references to external resources on these issues.
  - ITU-T Study Group 20 on Internet of Things (IoT) and smart cities and communities (SC&C) is responsible for studies relating to Internet of things (IoT) and its applications, and smart cities and communities (SC&C). This includes studies relating to big data aspects of IoT and SC&C, e-services and smart services for SC&C. ITU-T

SG20 is the lead study group on Internet of things (IoT) and its applications, smart cities and communities, including its e-services and smart services and for Internet of things identification.

- **Recommendation ITU-T L.1022 "Circular Economy: Definitions and concepts for material efficiency for Information and Communication Technology"** contains a guide to circular economy (CE) aspects, parameters, metrics, indicators for information and communication technology (ICT) based on current approaches, concepts and metrics of the CE as defined in existing standards, while considering their applicability for ICT. In this Recommendation ICT is defined as based on OECD [b-ISIC]. This Recommendation discusses the special considerations and challenges in a broader and more in depth context for all ICT defining parameters, metrics, and indicators with the intention to guide the vertical standardization of the material efficiency for ICT. The guideline aims to examine the kinds of standards that are available and to assess their relevance for ICT product groups citing examples of interrelated relevance throughout the text of the Recommendation.
- **Recommendation ITU-T L.1305 "Data centre infrastructure management system based on big data and artificial intelligence technology"** contains technical specifications of data centre infrastructure management (DCIM) system, with the following aspects being covered: principles, management objects, management system schemes, data collection function requirements, operational function requirements, energy saving management, capacity management for information and communication technology (ICT) and facilities, other operational function requirements and intelligent controlling on systems to maximize green energy use. Other items such as: maintenance function requirements, early alarm and protection based on big data analysis and intelligent controlling on systems to decrease the cost for maintenance are also considered.
- **Recommendation ITU-T L.1316 "Energy efficiency framework"** contains a framework of documents for collecting standards on energy efficiency metrics/key performance indicators (KPIs), measurement methodologies and energy management solutions for information and communication technology (ICT) equipment. The Recommendation suggests the selection of the appropriate document to reference when determining energy efficiency.
- **Recommendation ITU-T L.1380 "Smart energy solution for telecom sites"** focuses on smart energy solutions for telecom sites, mainly on the performance, safety, energy efficiency and environmental impact, when the system is fed by various types of energy such as photovoltaic (PV) energy, wind energy, fuel cells and the grid. The Recommendation also considers smart energy control. For example, if the grid is off, how can the energy flows be managed to achieve higher energy efficiency, get more green energy, etc.
- **Recommendation ITU-T L.1451 "Methodology for assessing the aggregated positive sector-level impacts of ICT in other sectors":** To date no international comprehensive methodology exists to assess the environmental impact of information and communication technology (ICT) at sector level, or to assess the aggregated positive effects of the ICT sector on other sectors of the economy.

Without a standard methodology evaluating the positive impacts of ICT, the role of ICTs in the fight against global warming will be only partially perceived. Recommendation ITU-T L.1451 addresses the need to contribute to achieve the targets and goals of the 2030 Agenda for Sustainable Development and specially its Sustainable Development Goal 13 (SDG13), the Connect 2030 Agenda and the Paris Agreement from a global perspective. This Recommendation addresses the opportunity to use a computable general equilibrium (CGE) model as a possible methodology for simultaneously assessing the environmental and economic impacts of ICTs at sectoral level.

- **Recommendation ITU-T L.1470 "GHG emissions trajectories for the ICT sector compatible with the UNFCCC Paris Agreement"** provides detailed trajectories of GHG emissions for the global ICT sector and sub-sectors which are quantified for the year 2015 and estimated for 2020, 2025 and 2030. In addition, it defines a long-term ambition for 2050. The trajectories, the long-term ambition and the 2015 baseline have been derived in accordance with ITU-T L.1450 and through complementing methods in support of the 1.5oC objective described by the IPCC in its Special Report on 1.5 oC [b-IPCC 1.5] and in support of Science-based Targets initiative (SBTi).

- ITU standards supporting the wide range of technologies under the banner of the Internet of Things will assist both developed and developing countries in transforming city infrastructure, benefiting from the efficiencies of intelligent buildings and transportation systems; smart energy and water networks; and innovation in the field of e-health. The IoT and Smart Cities and Communities Standards Roadmap is being maintained by JCA-IoT and SC&C. ITU-T SG20 has agreed **Supplement ITU-T Y.Suppl.58 "Internet of Things and smart cities and communities standards roadmap"**.
- ITU technical work to **combat ICT counterfeiting** continues to gain momentum with new standards under development, supported by ongoing studies into the scale and dynamics of the counterfeiting challenge. ITU-T SG11 developed plans for implementation of WTSA-16 Resolution 96 "ITU Telecommunication Standardization Sector studies for combating counterfeit telecommunication/ information and communication technology devices" and Resolution 97 "Combating mobile telecommunication device theft" where new work was started to develop a framework for combating the use of stolen mobile ICT devices, and supporting information on a framework for solution to combat counterfeit ICT devices; along with guidelines on best practice and solutions. Among latest results achieved in March 2019 are:
  - ITU-T SG11 approved **Recommendation ITU-T Q.5051 "Framework for combating the use of stolen mobile devices"**: With the increased functions and capabilities available on Mobile Devices, the importance and usage of these devices in people's daily lives have been growing in recent years. As a side effect, we also observe the rise, in some countries, of actions aimed to steal these devices and generate profit, not only by selling the equipment itself but also by illegally using the information contained on it.

    As a response, initiatives are needed to deter the theft and reuse of stolen Mobile Devices and to protect the consumer data stored on these devices against illegal use.

Since it is common to have devices stolen in one country, that may have deployed solutions to mitigate the use of stolen devices, sold into other countries or even regions where similar mitigation measures may not have been taken, it is critical to the success of such initiatives to have coordination and information sharing between the governments and operators from different countries that aims to combat the theft and reuse of stolen Mobile Devices in a global environment. Otherwise, there is a risk that the illegal trade of stolen devices could occur across international borders.

It is important to note that, since most solutions deployed today to deter the device theft and reuse problem rely on unique identifier lists, a common action taken by the traffickers to bypass these actions is to tamper with the device to alter its unique identifier, sometimes choosing an identifier already in use by a legitimate device, to allow the equipment to return to the market and to connect to mobile networks.

In response to this scenario, many countries around the world are engaged not only in combating the use of stolen Mobile Devices, but also in preventing the devices with unauthorized reprogrammed unique identifiers, commonly described as tampered identifiers, from returning to the network. Meanwhile governments in other countries are challenged and unclear on the best strategies to adopt, mainly due to a lack of knowledge or expertise to understand the issue and the possible solutions, and to make informed choices to deploy solutions, tailored for their individual countries, that could be effective. In this sense, guidelines are necessary to address this challenge, as indicated on the WTSA Resolution 97 (Hammamet, 2016).

Therefore, this Recommendation proposes a framework composed of requirements and a broad range of comprehensive and recommended measures that can be taken and applied to combat the theft and reuse of stolen Mobile Devices.

- Following the decision of Council-18, ITU-T SG11 started a new work item TR-RLB-IMEI "Reliability of IMEI identifier" which contains a study about key vulnerabilities on IMEI reprogramming on mobile devices and proposals to improve IMEI reliability.
- ITU-T SG11 started a new work item “Technical Report TR-CF-QoS: Impact of Counterfeit Mobile devices on Quality of Service" that aims to study the negative effects and impact of counterfeit mobile devices on network's quality of service along with the negative effects and service degradation experienced by the mobile subscribers.
- ITU-T SG5 is working on draft Recommendation ITU-T L.Counterfeit “Adequate Assessment and Sensitisation on Counterfeit ICT Products and their Environmental Impact”.
- ITU-T SG20 approved **Recommendation ITU-T Y.4808 “Digital entity architecture framework to combat counterfeiting in IoT”**: There are challenges related to the use and circulation of counterfeit devices in the market, including adverse consequences for users, governments and the private sector.

  As documented in the ITU-T Technical Report on Counterfeit ICT equipment [b-ITU-T TR on Counterfeit ICT Equipment], there are a lot of technical solutions which are widely used for combating counterfeit products over the globe. The report indicates that RFID tags are among technologies which are used for combating counterfeiting.

While this may be true, there are some difficulties associated with securing these systems with regard to the access control exercised to write on the tags. There are solutions established for combating counterfeit devices for specific technologies and/or industries which may not be applicable to all use cases. On the other hand, there are such solutions which may be applicable to all use cases, these solutions are based on the ITU-T Recommendations such as ITU –T Y.4459 "Digital entity architecture framework for Internet of things interoperability" and ITU-T X.1255 "Framework for discovery of identity management information". Resolution 188 (Busan, 2014) on combating counterfeit telecommunication/information and communication technology devices recognized (in recognizing e) that Recommendation ITU-T X.1255, which is based on the digital entity architecture, provides a framework for discovery of identity management information. A digital entity architecture, as described in ITU-T Y.4459, defines a minimum set of needed architectural components and services to provide a generic information and service interoperability. It will facilitate the interoperability of identification, description, representation, access, storage and security of IoT devices. This architecture framework encourages a common security and management interface across different IoT applications.

Digital entity architecture provides additional means of security (e.g. public key infrastructure) features to authenticate the parties involved in the identifiers registration process. Other industry approaches to combat counterfeiting are available. They rely on commonly acknowledged identifiers including, but not limited to MAC, IMEI, RFID, …etc. Systems based on digital entity architecture may be considered as one category of candidate tools which allow vendors/industries (not only ICT industry) to store their products' profile in digital form. Therefore, this Recommendation can be used in different industries such as ICT, pharmaceutical, automotive, avionic.

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)

235. The WSIS Prizes 2020 Winner for the Action Line C7 on E-Science is the Open Data Policy and Portal, Ministry of Transport and Communications, Qatar.

The Government of Qatar announced the adoption of open government policy in 2014. Therefore, a project was initiated to establish an open data platform that would allow the agencies to release and manage their datasets as well as the recipients to discover and make use of the datasets at a single place in the most efficient manner.

One of the four strategic thrusts of Qatar Digital

Government (QDG) Strategy 2020 emphasizes promotion of open government and this is also outlined in one of the strategic objectives to increase government openness. This aligns with the UN SDG "Decent Work and Economic Growth" directly, and indirectly influences the achievement of other SDG's such as Sustainable Cities and Communities, Industry, Innovation, and Infrastructure, and Quality Education.

The Open data portal launched in April 2019 will enable the government agencies in Qatar to readily publish the datasets in an open format ready usage of the datasets, thereby contributing to the achievement of the national goals. This will also enable the people, institutions and business to freely access the datasets that were previously not available.

Project website

https://www.data.gov.qa/pages/home/

Sustainable development goals related to this project

- Goal 1: No poverty
- Goal 4: Quality education
- Goal 7: Affordable and clean energy
- Goal 15: Life on land
- Goal 17: Partnerships for the goals

Target beneficiary group(s)

- Youth
- Women
- The unemployed
- Remote and rural communities
- Researchers

236. 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

237. As the co-facilitor of Action Line C7 on E-Learning, UNESCO highlighted the importance of Open Educational Resources (OER) by organising a high-level dialogue entitled “UNESCO

OER Recommendation: Implementation in the age of Covid-19" at the WSIS Forum 2020. Details of the session is available here.

238. The high-level dialogue saw the participation of representatives from civil society, academia and policymakers. In particular, the discussants examined the use of OER for ensuring equal access to knowledge and learning opportunities, especially in circumstances such as those currently imposed by to the COVID-19 pandemic on virtually all societies across the world. Other debated topics included how artificial intelligence and other emerging technologies can be harnessed to speed up the implementation of the OER Recommendation, as well as innovation in national implementation of OER in Morocco and in the Philippines.

239. The WSIS Prizes 2020 Winner for the Action Line C7 on E-Learning is the First International CyberSchool of the future for the new IT generation, KIBERone, Russian Federation.

The CyberSchool KIBERone is the international CyberSchool of the future for the new IT generation, a project for additional training of children from 6 to 14 in digital technologies.

The project participants focus on several important tasks:

1. to provide the young generation with modern digital skills that are not taught in secondary schools, but are in demand in the era of global informatization;

2. teach children to use various gadgets for the benefit of learning and development and make them full-fledged members of the information society.

The project contributes to the early professional orientation of children and, in the long term, to the reduction of the deficit of qualified IT specialists, which is currently observed around the world.

For this purpose, a long-term integrated development program is being developed within the project, which includes teaching popular programming languages (Python, Java, JavaScript, etc.), developing computer games, artificial intelligence and virtual reality technologies, blockchain, web development, cybersecurity, and much more.

The curriculum contains more than 50 areas, and this is the largest number among all the curricula on the market.

In the classroom, children get acquainted with innovative technologies, learn what programming is and why it is interesting and exciting, become developers of their own digital projects.
The program is developed by existing employees of large IT companies who have experience in creating innovative IT products, and tutors are practicing IT specialists who are able to pass their experience and knowledge to the younger generation in an accessible language. The total period of study at the CyberSchool is up to 9 years.

Project website

https://kiber-one.com/

Sustainable development goals related to this project

- Goal 4: Quality education
- Goal 8: Decent work and economic growth

Target beneficiary group(s)

- Youth
- Children and adolescents aged 6-14 years

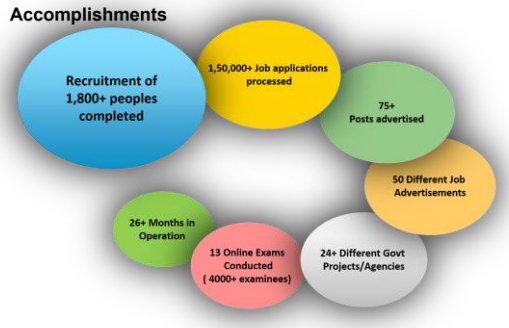
240. As the lead agent for all ITU capacity building activities, the ITU Academy continues to produce publications as part of its main deliverables. Some activities on curriculum development are available on the following link: https://academy.itu.int/index.php/main-activities/curriculum-development.

Action Line C7: E-Employment

Related to the SDGs: SDG 4 and SDG 8

241. The Action Line C7 E-Employment Facilitation Meeting, co-organized by the ITU and ILO, was held on Wednesday, 29 July 2020. The topic of the meeting was "Digital skills and the futire of work: Challenges and opportunities in a post Covid-19 environment". Details of the session are available here.

242. The WSIS Prizes 2020 Winner in category e-Employment is Recruitment Process Management as a Shared Service for Govt Agencies of Bangladesh, Bangladesh Computer Council, Bangladesh.



The concept of shared platform/services to facilitate citizen service delivery utilizing emerging technologies is a crucial part of Bangladesh National Digital Architecture. It ensures cost reduction and optimization is achieved while improving process, information systems and technology support in a disciplined manner. Bangladesh Computer Council established this System as a shared service for all govt agencies. It enables the Govt agencies to accomplish end-to-end recruitment process and related tasks through increased interoperability, enhanced security measures, reduced risk and lower procurement costs.

It's a web based secure system to process recruitment management activities electronically. It covers activities from Job posting to shortlisting of candidates. There is facility to manage Question Bank and online exam. It contains Provision of Online transaction verification with Bank. It's integrated with DLS platform (a private Blockchain infra) for storing admit card info. It has 3 modules – e-Recruitment module, Exam Controller module and Online Exam module

Results achieved:

This System is a successful project based on implementation achievements. It has been used by 24+ Govt agencies/projects. Recruitment of 1800+ applicants is already completed! It has processed 1,50,000+ online job applications against 70+ posts of 50+ different recruitment notices in last 2+ years. Several entities have used this system multiple times. 2-3 new agencies are in pipeline.

Impact:
It has helped agencies to process large number of job applications within shortest time & effort and enable agencies to focus on their core functionalities. We are seeing impressive response from govt organizations and applicants. It's saving govt expenditure to a great extent as they no longer need to procure similar system. Job applicants from rural areas are now able to apply with ease and relieving them from standing in queue in bank branch. It's creating positive impression among applicants about govt services

Project website

https://erecruitment.bcc.gov.bd

Sustainable development goals related to this project

- Goal 1: No poverty
- Goal 8: Decent work and economic growth
- Goal 10: Reduced inequalities

Target beneficiary group(s)

- Youth
- Women
- People with disabilities

- The unemployed
- The poor
- Remote and rural communities
- Job seekers

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)

243. The Action line C7 E Business Facilitation meeting was held on Wedensday, 26 August 2020 as an integral component of the WSIS Forum 2020. The topic of the meeting was "Accelerating the creation of value in e-business for developing countries." It was held in cooperation with the UNCTAD (United Nations Confere nce on Trade and Development), the ICT (International Trade Centre) and the Universal Postal Union (UPU). This session examined how digitalization is changing the way e-business creates value, how the digital transformation of postal infrastructure and services can accelerate sustainable e-business and e-commerce development, and how to replicate good practices in SME inclusion. With over 100 participants from all regions of the world, using remote participation tools, this was the most attended C7 E-Business action line meeting of the past 15 years of action line meetings. For more details on this meeting please see here.

244. The novel coronavirus COVID-19 is having a profound impact on the economy and the businesses that drive it. With countries in various stages of lockdown, it is becoming clear that the virus has also impacted small and medium-sized enterprises (SMEs). There is a need to step up efforts to help SMEs go digital and make supply chains more open and inclusive. Disruptions to the Postal infrastructure and services forced rapid innovation to allow it to continue to provide services essential to connect and enable businesses and citizens during this lockdown.

245. The WSIS Prizes 2020 Winner for the Action Line C7 on E-Business is the Business Digital Transformation Centers, Ministry of Information and Communication Technology, Colombia.

The Digital Business Transformation Centers (CTDE) are a strategy of the ICT Ministry and iNNpulsa Colombia in partnership with the main Chambers of Commerce and Guilds of the country, which aims to accompany MSMEs in the digital transformation of the processes of

the chain of value of the company, through the tactical appropriation of technologies and cultural change, as a long-term strategy, which will allow them to improve their productivity and competitiveness.

CTDEs are the places where MSMEs find the necessary technical assistance and advice that will allow them to develop a successful transformation route. The process begins with a diagnosis of the digital state of the business, where the degree of technological adoption and the organizational capacity to manage the transformation are measured, and the process that has the greatest impact on the business is identified. From this diagnosis, a transformation route is formulated and implemented to improve this process, which articulates actions associated with the development of organizational enabling capacities, as well as the implementation of technological tools that enhance the business structure. The entrepreneur receives permanent support and advice throughout the year that the route implementation lasts.

Project website

https://www.centrosdetransformaciondigital.gov.co

Sustainable development goals related to this project

- Goal 4: Quality education
- Goal 5: Gender equality
- Goal 8: Decent work and economic growth
- Goal 10: Reduced inequalities
- Goal 12: Responsible consumption and production

Target beneficiary group(s)

- Women
- Mipyme

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

WSIS ACTION LINE 8 CULTURAL 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)

SUSTAINABLE DEVELOPMENT GOALS

246. The WSIS Prizes 2020 Winner for the Action Line C8 is the Attaa initiative (العطاء الرقمي), Ministry of Communications and Information Technology, Saudi Arabia.

Technology today has great importance in our lives and in society development, as it has major role in facilitating human life and increasing efficiency, productivity as well as improving quality of life. Technology has become an indispensable foundation in most countries today and it is not luxury anymore.

Saudi Arabia is undertaking the largest and most ambitious economic reform and transformation program in its history, where digitization is key enablers of these wide-ranging reforms.
One major challenge lies in building digital skills and addressing digital literacy among citizens where it is necessary to enable them with the proper use and utilization of technology, to improve the soci-economical impact.

Internet penetration has improved to reach 93% and our citizens spend on average 6:45 hours online where more than 70% of this time on social media.

On the other hand, Arabic-speakers comprise 5.8% of the users on the internet while online Arabic content is less than 0.6%, compared to other languages such as German and Russian where users are less than 2% and online content is around 6%.

Thus, we came us with the first specialized voluntary initiative in digital awarness for Arabic speaking, where more than 28 thousand speacialized ICT volunteers has joined so far, and beneficiaries exceed 7 million in the first year, with the help of tech specialists who contribute and enrich Arabic technical content and spread the digital culture to bridge the technical knowledge gap of Arabic speakers around the world through multiple tracks:
1- E-learning, A platform has been set up to train the members of the community on various technology subjects where online training contents gets created by experts and published for all Arabic speaking users to benefit from.

2- Conduct Training and hold techical events in all Kingdom's regions through volunteers (later on will be expanded some Arabic contries).

Project website

https://attaa.sa

Sustainable development goals related to this project

- Goal 4: Quality education

Target beneficiary group(s)

- Youth
- Older persons
- Women
- Indigenous and nomadic peoples
- People with disabilities
- The unemployed
- The poor
- Migrants
- Remote and rural communities

247. ITU actively facilitates access to and use of ICTs by Indigenous Peoples to contribute to their digital inclusion, social and economic development and preservation of their heritage and cultural legacy through the use of ICTs. Several training programmes have been organised, which benefited more than 2,800 indigenous leaders from Latin America and the Caribbean. Many communities that have received training and in which projects based on these capacity-building processes for indigenous peoples are developed. 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)

248. The WSIS Prizes 2020 Winner for the Action Line C9 is Voices of Women Media, Voices of Women Media, Nepal.

VOW Media wants to contribute to a world where women enjoy their basic rights and live with dignity, equality, and justice. It is a non-profit organization that is committed to providing women from marginalized communities with innovative media and technology tools to enable them to voice their own lives, to empower them and strengthen their voices. The advancement of women's leadership capabilities can be fostered by the creation of a positive self-image and a stronger sense of identity through the use of art, media, and education. We believe that through reflecting on and personalizing women's individual experiences we can stop violence inflicted on women, change social norms and fight against discrimination. Our work focuses specifically on strengthening feminist voices, right to technology, right to mobility, young women's leadership & transitional justice. We also run various campaigns and educational outreach programs which plays a role in contributing to cultural & social change in our communities. VOW Media believe that she can use culture to change culture. To strengthen young girls and provide opportunities for women to lead, we must consider education, reproductive health, economic justice, access to technology, right to mobility and the impact of sexual and domestic violence.

Project website

http://www.voicesofwomenmedia.org

Sustainable development goals related to this project

- Goal 5: Gender equality
- Goal 9: Industry, innovation and infrastructure
- Goal 16: Peace, justice and strong institutions

Target beneficiary group(s)

- Women

249. 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.

250. Moreover, ITU 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-T is also working to enhance accessibility features of audio-visual media through the IRG AVA, and has organized three IPTV Application Challenges to promote innovative IPTV applications, and motivate experts across the broad IPTV ecosystem to develop original and creative IPTV applications based on ITU's suite of IPTV Recommendations.

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

- **Recommendation ITU-T H.222.0 (2019) Amd.1 "Information technology - Generic coding of moving pictures and associated audio information: Systems: Carriage of**

JPEG XS in MPEG-2 TS" adds support for the carriage of data encoded according to ISO/IEC 21122-1, also known as JPEG XS, to Rec. ITU-T H.222.0 (08/2018) | ISO/IEC 13818-1:2019.

- **Recommendation ITU-T H.430.4 "Service configuration, media transport protocols, signalling information of MMT for Immersive Live Experience (ILE) systems":** ILE services are realized by several types of information such as video, audio, lighting and stage effects, and the information should be transferred synchronously from source site to viewing sites. This document identifies service configuration, system structure, media transport protocol and signalling information for Immersive Live Experience (ILE) systems using ISO/IEC 23008-1 (MPEG Media Transport). This specifies constrains to ISO/IEC 23008-1 for ILE systems.
- **Recommendation ITU-T H.265 (V7) (revised) "High efficiency video coding"**: This revision adds additional SEI messages for fisheye video information and annotated regions, and also includes corrections to various minor defects in the prior content of the Specification. This Recommendation was developed jointly with ISO/IEC JTC 1/SC 29/WG 11 (MPEG), and Rec. ITU-T H.265 is maintained as technically aligned twin text with ISO/IEC 23008-2. The technical changes in this edition were developed in a joint collaborative team with MPEG in technical alignment with a not-yet-published edition of ISO/IEC 23008-2.
- **Recommendation ITU-T H.266 "Versatile video coding"** provides text for the new video coding Recommendation entitled "Versatile video coding" (VVC). This Recommendation 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. Some key application areas for the use of this standard particularly include ultra-high definition video, video with a high dynamic range and wide colour gamut, 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.
- **Recommendation ITU-T H.274 "Versatile supplemental enhancement information messages for coded video bitstreams"** provides text for a new Recommendation that 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.

- **Recommendation ITU-T H.430.5 "Reference models for immersive live experience (ILE) presentation environment"**: In order to reproduce a highly realistic experience and sense of immersiveness for audiences at a viewing site on par with the experience of audiences at the event site at the same time, and also to reduce the design and setup times of ILE viewing sites, this Recommendation specifies reference models for the Immersive Live Experience (ILE) presentation environment. This document provides three reference models for proscenium, open, and arena style presentation environments, and provides functional blocks and some implementation guidelines for ILE viewing sites as informative information.
- **Recommendation ITU-T H.626 (V2) (revised) "Architectural requirements for video surveillance system":** The video surveillance system has the functions of display and storage of the multimedia (such as video, audio and image) captured by multiple remote cameras over an IP network for multiple users, as well as remote control, alarm and linkage actions, recording and playback. Recommendation ITU-T H.626V2 defines the functional architecture for video surveillance system based on IP networks. This Recommendation defines the model, architecture, entities and reference points of the video surveillance system. This Recommendation also defines the hierarchy model for deployment and the interworking between the video surveillance systems and other multimedia systems. This revision updates the title, deletes requirements and service flows, revises the architecture and reference points according to the latest development and changes.
- **Recommendation ITU-T H.627 (V2) (revised) "Signalling and protocols for a video surveillance system"** defines the detailed signalling flows and relevant protocols of a video surveillance system, based on the requirements defined in Recommendation ITU-T F.743V2 and the functional architecture defined in Recommendation ITU-T H.626 (V2). This revision updates the title of this Recommendation, adds the overall requirements, revises the signalling flows and relevant protocols.
- **Recommendation ITU-T H.629.1 "Scenarios, framework and metadata for digitalized artwork images display system"** identifies the typical application scenarios (e.g., museum, art gallery, home, etc.) of digitalized artwork images display system; it identifies metadata for the content provider, the display terminal and the digital artworks in the digitalized artwork images display system; it identifies the specifications of electro-optical for the display terminal in the digitalized artwork images display system; and it provides the measurement methods and evaluation guidance for the electro-optical parameters.
- **Recommendation ITU-T H.644.3 "Functional architecture of multimedia content delivery networks"** specifies the common functional architecture for multimedia content delivery network. The Functions and Functional blocks within this common functional architecture and the related reference points are specified in this Recommendation for matching the requirements of various kinds of content ingestion, content distribution and content delivery within different network and platform. In addition, this Recommendation also gives some examples of the related service features, workflows, implementation guide and the security aspects in

Appendixes. This Recommendation is intended to provide the references for MCDN providers to help them to build the common infrastructures of a multimedia content delivery network. With this Recommendation, it is benefit for different multimedia content providers to dispatch their content to the different types of end-users by taking advantage of a common MCDN capability.

- **Recommendation ITU-T H.702 (V2) (revised) "Accessibility profiles for IPTV systems"** defines three profiles for accessibility features in IPTV systems, with increasing levels of support. Accessibility information such as caption, sign language and audio description that are sent separately from video contents to IPTV terminal devices. By defining the above profiles, persons with disabilities can choose more easily the terminal devices that have the functions they need. The set of parameters within each profile were identified in consultation with the assistance of persons with disabilities participating in the work of ITU-T. This version includes the accessibility profiles for cognitive disabilities and appendix about an example for H.702 based system, and harmonizes the latest term definitions.
- **Recommendation ITU-T H.704 "Enhanced UI framework for IPTV terminal device - Gesture control interface"** defines the general requirements, functional elements and interfaces supporting enhanced capability of user interaction by gesture recognition and controlling over IPTV terminal devices, based on the enhanced user interface (UI) framework defined in [ITU-T H.703]. Those functional elements are described in the gesture controlling enabler and gesture recognition enabler defined in this Recommendation. Moreover, the procedures of interaction between gesture recognition device and gesture-controlled device are defined with the recommended information used in the interaction. This Recommendation enables the gesture controlling feature in the Enhanced IPTV User Interface defined in [ITU-T H.703]. With those features, users can control the operation of IPTV applications in an IPTV terminal device in a convenient, natural and comfortable way.
- **Recommendation ITU-T H.753 "Scene-based metadata for IPTV services":** Scene-based metadata (SBM) for IPTV services defines the metadata element and format for content distribution over an IPTV terminal device and describes metadata management functions of SBM, which basically supports IPTV multimedia application frameworks in the Recommendation ITU-T H.760 series. This enables various content providers and distribution platforms to use standardized metadata during the process of content distribution and service provision. Therefore, this can maximize metadata generation and distribution efficacy through avoiding unnecessary data conversion and duplication. Moreover, intelligent and personalized smart broadcast service can be generated in convenience with using the metadata. In addition, this standard can be used by not only terrestrial broadcasting service provider and CATV/IPTV broadcasting service provider, but also third-party media providers and end users. As well, this standard can provide smart media application eco-system by applying media commerce, advertisement, education, etc. Scene-based metadata is based on ITU-T IPTV functional architecture and terminal devices defined in the ITU-T H.720-series and service defined in the Recommendation ITU-T H.750. This Recommendation also describes the Web-based functions for scene-based metadata service and the scene-based service workflow.

- **Recommendation ITU-T H.764 (V2) (revised) "IPTV services enhanced script language"** describes an object-oriented programming language called "Internet protocol television services enhanced script language (IPTV SESL)" as one of multimedia application frameworks for web-based IPTV services. This language is used to perform computations and provide interoperability among multimedia applications within an IPTV terminal device environment. IPTV SESL is classified into "Core script profile" and "Extended script profile" in this Recommendation. The core script profile describes a subset of objects defined in LIME-Script of Recommendation ITU-T H.762. The extended script profile defines the additional objects to perform video and interactivity related computations. This Recommendation describes the requirements of properties, functions and methods of IPTV SESL to be supported by these two profiles. This revision corrects or clarifies the definitions of some properties and methods in extended script profile and makes some editorial modifications.
- **Recommendation ITU-T T.701.11 "Guidance on audio descriptions (twin text of ISO/IEC TS 20071-11:2019, Information technology - Guidance on alternative text for images - Part 11)"** gives guidance on how to create text alternatives (also known as "alt-text") and what information to put in text alternatives. This Recommendation applies to all still images that are used in any type of electronic document. It also applies to individual images within a slide show. The alternative text guidance provided in this Recommendation is not applicable to moving images (e.g. movies). This Recommendation is a twin text with ISO/IEC 20071-11:2019 "Information technology – User interface component accessibility – Part 11: Guidance on text alternatives for images", prepared by ISO/IEC JTC1 SC35 "User interfaces".

252. 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.

253. 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.

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

255. 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.

256. 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.

257. 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.

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

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

260. 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.

261. 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

262. ITU Membership outreach:

263. 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 Bureaux and Sectors, the ITU regional and area offices and the relevant international organisations and national authorities.

264. 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, Associates and Academia bers (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;

- More than 100 academia members.

265. 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.

266. UNESCO organised a high-level dialogue "Promoting Global Cooperation to harness the power of AI to mitigate COVID-19" on 8 September 2020 at 13:00-14:00 CEST during the final week of the WSIS Forum 2020. The session highlighted best practices and lessons learned in harnessing AI to combat COVID-19, and proposed recommendations going forward concerning the way a human-rights based and ethical AI can be harnessed to meet the sustainable development goals and future epidemics. Details of the session are available here.

267. The WSIS Prizes 2020 Winner for the Action Line C10 is ICT and Media: Efficient tools for youth to Counter Violent Extremism, Ghana Investment Fund for Electronic Communications, Ghana.

The Internet and ICT has become embedded in every aspect of our day- to-day lives and the way we interact with others.

Notwithstanding the positive impact of the internet and ICT on peoples lives, it is also being negatively used for bigotry, racism, exclusion, xenophobia and discriminatory thoughts and values.

Fake news, misinformation, deception, hoaxes, propaganda and satire are used to package false information as authentic to influence the youth to radical ideology and violent motives. In Ghana, about 87.1% (Ahiabenu, 2018) of newsrooms report their stories from social media or user- generated content, this makes the media houses more susceptible to fake news.

We believe that the Internet is the one of the platforms the youth are recruited because it is used as a tool for both active and passive communication and outreach.

Attacking or pulling down their sites could be a temporary solution, but not a permanent one. To counter those radical activities and violent promoting sites, Ghana Investment Fund for Electronic Communications (GIFEC) believes that one should start from the bottom; Education, Media and Information Literacy (MIL) and empowerment of young people to do

it by themselves, which will be the most efficient tool to counter and fight such extreme ideologies and radical narratives.

This project aims at countering the propaganda of the radical groups and their ideology by providing counter narratives to diminish their extremism ideas and cut the road on increase on negative societal peer influence.

• 300 young leaders (50% women) have received training on active citizenship, ICT, technical Media know-how and researching techniques.

• 300 young leaders are equipped with the necessary technical and knowledge skills and able to launch online "No Hatred words campaign".

Project website

http://gifec.gov.gh

Sustainable development goals related to this project

- Goal 1: No poverty
- Goal 4: Quality education
- Goal 9: Industry, innovation and infrastructure
- Goal 16: Peace, justice and strong institutions
- Goal 17: Partnerships for the goals

Target beneficiary group(s)

- Youth
- Remote and rural communities

Action Line C11: International and Regional Cooperation

268. The WSIS Prizes 2020 Winner for the Action Line 11 International and Regional Cooperation is Asociación Innovactoras, Spain.

"Innovactoras" started as a social responsibility project of Happeninn. Today it is a platform of innovators women from different realities of the 21st : science, technology, business, education and society. 51 North and South references (16 countries) are already inspiring innovation around the world Objectives: Organizations to have inspiring and current examples of women in STEAM careers, to encourage innovation in their environments. Connects, promotes and supports women innovators. Award a prize to a young Innovactora every year. 100 inspiring Innovactoras of 25 countries by 2020. Sustainable with public private founds.

Project website

https://innovactoras.eu/#up

Sustainable development goals related to this project

- Goal 4: Quality education
- Goal 5: Gender equality
- Goal 16: Peace, justice and strong institutions

Target beneficiary group(s)

Women

(d) WSIS Implementation at the Regional Level

269. 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.

270. UN Regional Commissions are working towards Regional WSIS Implementation and Review at the Regional Level.

271. 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.

272. The WSIS Regional Review for Asia and the Pacific meeting was held virtually on 11 August 2020, jointly co-organised by UNESCAP and ITU. The meeting highlighted the implementation of the WSIS Action Lines in the region for the achievement of the SDGs. Outcome document of this meeting is available here: https://www.unescap.org/sites/default/files/Outcome%20document%2C%20final.pdf

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

273. 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.

274. UNCTAD took over the Chairmanship of UNGIS for period 2020-2021. The Vice-Chairs are ITU, UNDP, UNESCO, and UNESCAP.

275. 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.

276. As the current Chair of UNGIS, UNCTAD has initiated a *Dialogue on the Role of Digitalization in the Decade of Action* to raise awareness of both the importance of digitalization in achieving the SDGs and of the unique opportunity that UNGIS presents for more effective collaboration in this area within the UN System.

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

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

278. In 2019-2020, more than 180 statistical indicators from over 200 economies worldwide were collected through five annual questionnaires. The data were disseminated through the ITU website, online portal, electronic download and USB-key and printed publications such as the 45th edition of the Yearbook of Statistics, and the 26th (July 2020) edition of the World Telecommunication/ICT Indicators database (WTID), available for both Windows and Mac users.

279. ITU is an active member of the Partnership on Measuring ICT for Development[3] 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

PARTNERSHIP ON MEASURING ICT FOR DEVELOPMENT

[3] 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.

endorsed by the United Nations Statistical Commission, provides the basis for the production of ICT statistics in countries all over the world.

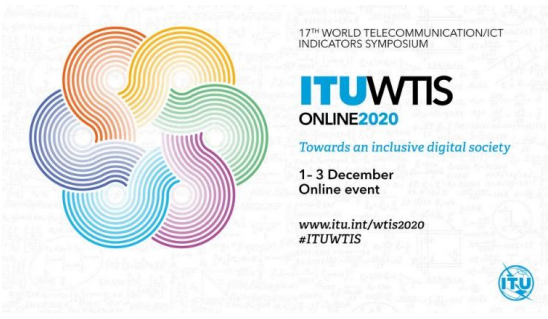
280. The Partnership is actively engaged in monitoring the Sustainable Development Goals. The 2030 Agenda for Sustainable Development recognizes that "the spread of information and communications technology and global interconnectedness has great potential to accelerate human progress, to bridge the 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.

281. 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.

282. During the WSIS Forum 2020, the Partnership organised a session where it presented its report "Partnership on Measuring ICT for Development: Information and communication technology statistics (E/CN.3/2020/23)", which was previously presented at the 51st Session of the Statistical Commission that was held in New York on 3-6 March 2020. The Report introduced new indicators which reflect the latest developments in ICT adoption and use by households and individuals, and recent progress on the use of big data that can be used to measure ICT availability and use in sectors relevant to the SDGs that are not currently covered in the global SDG indicators framework. In general, there was support to the indicators presented and to the work of the Partnership from the Commission members.

283. The 11th Meeting of the Expert Group on Telecommunication/ICT Indicators (EGTI) and the 8th Meeting of the Expert Group on ICT Household Indicators (EGH) took place back-to-back in virtual format, from 14 to 18 September 2020. 378 participants from national statistical offices, ministries, regulators, international and regional organizations, and the private sector attended these meetings. The topics covered during the EGH meeting included the measurement of ICT skills, and how to measure the number of Internet users accurately. The ITU Manual for Measuring ICT Access and Use by Households and Individuals, 2020 Edition was formally launched. The EGTI meeting covered the following topics: launch of the Handbook on Telecommunication/ICT Indicators, 2020 Edition indicators; indicators for measuring 5G; international roaming indicators; future work; and the EGTI/EGH joint session on ICT statistics in times of COVID-19.

284. The **17th World Telecommunication/ICT Indicators Symposium (WTIS)** will take place in virtual format from 1 to 3 December 2020. The theme of the WTIS-20 is "Towards an inclusive digital society", and will feature 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) will be presented for adoption by WTIS-20.

285. **Measuring Digital Development: ICT Price Trends** 2019 was launched in 2020. The publication monitors the affordability of ICT services by analysing and comparing price data for mobile-voice services, mobile data and fixed broadband for analysts, telecom operators, policy-makers and economists. The report provides analysis in terms of dollar price, exchange-rate adjusted prices and affordability for mobile-voice, mobile and fixed broadband according to internationally agreed baskets for services, including bundled services. It also provides information on countries' progress towards achieving the Broadband Commission for Sustainable Development's target for 2025, according to which entry-level broadband services should be made affordable in developing countries at a level corresponding to less than 2 per cent of monthly GNI per capita.

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

(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).

287. 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 12,000 entries and a growing community of 350.000 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.

288. 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).

289. The United Nations Economic and Social Council ECOSOC resolution 2018/28 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.

290. 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 2020**, that was released at the WSIS Forum 2020.

(h) Emergency Telecommunications (Para 91 of TAIS)

BDT Upcoming/ongoing

291. Launch of the ***Global Guidelines for National Emergency Telecommunications Plans***, during an online forum that took place on the 18th of March 2020. These guidelines are a critical tool to assist policy makers and national regulatory authorities to develop a clear, flexible and user-friendly national emergency telecommunications plan with a multi-stakeholder approach. The guidelines can be used for developing tailored contingency plans for emergencies caused by natural hazards, epidemics and pandemics. This includes national policies and procedures as well as governance to support and enable the continued use of reliable and resilient ICT networks, services and platforms for disaster management.

292. Launch of the ***"Emergency Telecommunications Table Top Simulation Guide"***, jointly developed with the Emergency Telecommunications Cluster – ETC (WFP). This guide which was launched during the online forum that took place on the 18th of March 2020 is key to assist member states and national stakeholders working on disaster management and disaster risk reduction, to plan design and conduct table top simulations (TTXs). TTXs allow stakeholders to test and refine emergency telecommunications plans, policies and procedures, as well as to verify whether networks, redundant communications capacity, personnel, and other telecommunications systems are in place.

293. In the face of the global COVID-19 crisis, BDT launched a "***Guide to develop a telecommunications/ ICT contingency plan for a pandemic response"*.** Unlike other disasters that may cause severe devastation to telecommunications/ICT infrastructure, the Covid-19 pandemic has caused an increase in data traffic on both wired and wireless networks due to higher online communications demand from households, for example, students taking classes online, employees working remotely from home, and people undertaking daily activities via the Internet. This Guide focuses on telecommunications/ICT service delivery and business continuity in the specific context of a pandemic such as Covid-19 and outlines a set of actions that countries can take to prepare for, anticipate and be ready to promptly respond and ensure network continuity and delivery of services. Telecommunications/ICT services include fixed, mobile, satellite, terrestrial, WiFi and any other technology enabling broadband and broadcasting services.

294. During the WSIS High Level Dialogue on "*Women and emergency telecommunications: ensuring gender equality in building disaster resilience",* that took place on 6 August 2020, BDT launched a new publication on ***"Women, ICT and Emergency Telecommunications:***

Opportunities and Constrains". This report, jointly developed with the Emergency Telecommunications Cluster – ETC (WFP), outlines a range of factors that underscore the digital gender divide and the increased vulnerability of women and girls before, during and after disasters. It also showcases good practices and examples for utilizing ICTs to advance gender equality in disaster risk management, including through the use of new and emerging technologies, and identifies priority areas for the way forward.

ITU's support to develop NETPs

295. BDT is providing assistance to several countries to develop their NETPs, including, Afghanistan, Saint Lucia, Somalia, Sudan, Ecuador, Perú, among others. Several national online meetings have taken plan 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.

ITU's disaster response support

296. ITU provided support to the Government of Vanuatu after the devastation caused by category 5 Hurricane Harold that struck the country on 6 April 2020. Several islands of Vanuatu were devastated living a legacy of loss of lives and livelihoods. Almost 90% of the ICT terrestrial infrastructure was severely damaged, leaving Vanuatu without telecommunications links for several days. Due to Covid-19 pandemic, no equipment could be deployed, however support was provided through a collaboration with Kacific, who agreed to provide satellite connectivity, in particular to remote and outer islands where existing telecommunication networks were destroyed.

Events

297. The Common Alerting Protocol (CAP) implementation workshop took place from 28 to 30 September. This event, organized by Eliot Christian and hosted by ITU, was attended by over 700 online participants. The workshop focused on emergency alerting and provided an overview of how CAP implementers and other associated organizations are leveraging and expanding the adoption of this protocol. Presentations also addressed a wide range of topics presented by experts from around the world.

298. A Regional online workshop on ICT Tabletop Exercises, Common Alerting Protocol (CAP) and Tampere Convention for Disaster Management took place in the Arab Region from 28 to 29 October 2020. This 2-day online workshop highlighted the benefits of using CAP and provide an opportunity to share best practices and lessons learned on its implementation at a national level. In addition, the event showcased and demonstrated the benefits of developing a Table-Top or TTX simulation exercise and emphasized the importance of the Tampere Convention.

Upcoming activities/events

299. ITU and the United States Telecommunications Training Institute – USTTI are jointly developing a Webinar on "Building Disaster Resilience through Emergency Telecommunications in 2020". This event which will take place on 15 and 16 December 2020, from 9h00 to 12h00 will highlight the role of emergency telecommunications for disaster risk reduction and management and discuss best practices for increasing ICT resilience and capacity for saving lives and limiting the impact of natural and manmade hazards. At the same time, it will highlight the strategic importance of Information and Communication Technology (ICT) networks and services for social welfare and the global economy in times of pandemics such as COVID-19.

Disaster connectivity map

300. Disaster Connectivity Map (DCM) initiative between ITU and ETC was built to help understand, monitor, and illustrate the type, the level and the quality of connectivity. The DCM will provide stakeholders responding to emergencies with important information on their response to the emergency telecommunications requirements.

Emergency Telecommunications Roster

301. The ITU emergency telecommunications roster initiatives was launched in September 2019. This initiative which is intended to increase the ITU disaster response support in the aftermath of disasters, was put on hold due to COVID-19. At the moment, the selection process of all the applicants is still ongoing and will be communicated before the end of 2020.

Collaboration with other UN entities

302. ITU is contributing to a UNDRR training project on Early Warning Systems for broadcasters. This project is a special collaboration between UNDRR, WMO, IOC-UNESDCO, ITU 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 risk by sending the correct message for impending hazards to end users. This project will be launched in December 2020.

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

303. 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.

304. 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

305. 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 (ICTs), the World Summit on the Information Society (WSIS) 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).

306. 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.

307. 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.

308. The theme for WTISD-20, "Connect 2030: ICTs for the Sustainable Development Goals (SDGs)" aimed to reinforce ITU's commitment to connect everyone, everywhere, while showing how ICTs can contribute to accelerating the achievement of the UN 2030 Agenda for Sustainable Development. More details are available here:

https://www.itu.int/en/mediacentre/backgrounders/Pages/connect-2030-agenda.aspx

309. Since the 2030 Agenda was launched in 2015, ITU, as the UN specialized agency for ICTs, has experienced how digital technologies are influencing all 17 Sustainable Development Goals (SDGs) from vision to action. So, in 2018, ITU Member States adopted the Connect 2030 Agenda for Global Telecommunication/ICT Development (Plenipotentiary Conference-Resolution 200, Rev. Dubai, 2018), affirming a shared global vision where telecommunications/ICTs enable and accelerate social, economic, and environmentally sustainable growth and development for everyone, everywhere.Due to the COVID-19 pandemic, WTISD-20 took place in a fully virtual format for the first time. The event brought together ITU partners to showcase how ICTs can accelerate the achievement of the SDGs, as well as to share how ICTs are used to respond to the COVID-19 pandemic. By presenting how they use the technology on the ground, different stakeholders showed how they help ensure business continuity during this period, while highlighting the potential of ICTs as

enablers of development, as well as the importance of enhancing collaboration and cooperation across countries and sectors.

(k) Bridging the standardization gap (BSG)

310. The revamped BSG Programme is structured around 5 pillars in line with governing texts, such as PP Resolution 123 (Dubai, 2018) and Resolution 44 (Hammamet, 2016. 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.

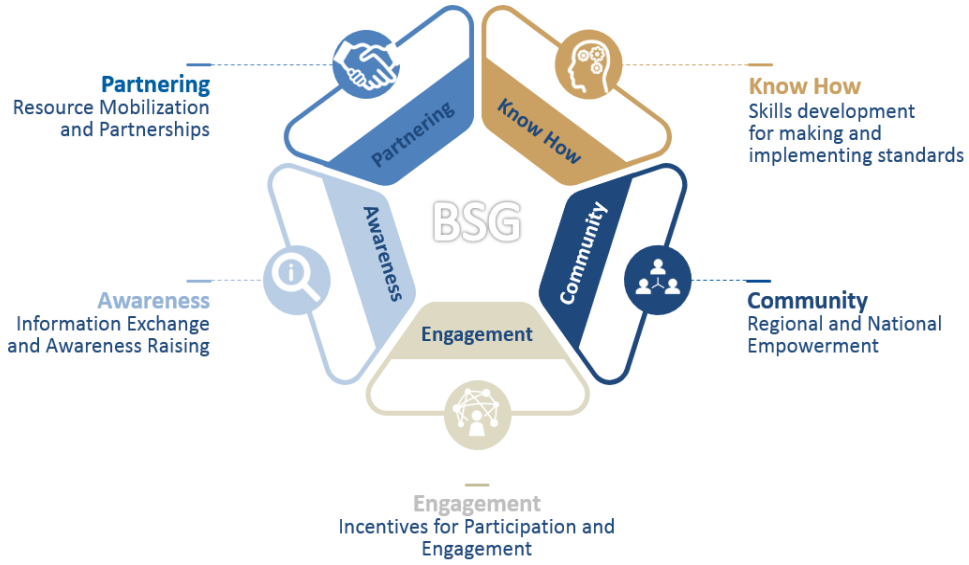


Figure 1: Pillars of the BSG programme

311. ***BSG Engagement*** is about facilitating participation in standards development. This includes fellowships, mentorship programmes and tools for remote participation.

312. 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.

313. 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.

314. 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.

315. 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.

316. These BSG training sessions have welcomed 150 delegates in 2020. A BSG training session was organized in collocation with SG11 and SG13 in March 2020. A BSG session was delivered during the SG13-RGAFR meeting in Abuja, Nigeria, 5-6 February 2020. A BSG-related session on ITU-T Approval Processes on regional Recommendations and on the ITU-T A.5 qualification and justification process was given during the SG3RG-AFR virtual meeting, 6-10 July 2020. Considering the shift to fully virtual ITU-T meetings in response to COVID-19, four virtual BSG training sessions have been organized since May 2020 and additional trainings are being planned for the remaining quarter of 2020. An inter-regional Arab-African hands-on training programme was held in Dubai, UAE, 20-21 October 2019, in conjunction an ITU Inter-Regional Standardization Forum discussing issues pertinent to the African and Arab regions' participation in ITU-T SG2 and SG3 and meetings of the African and Arab Regional Groups within these two SGs. TSB offered a full-day training session on the use of TSB services and tools in conjunction with the second African Telecommunications Union's Regional Preparatory Meeting for WTSA-20 in Entebbe, Uganda, 7-11 October 2019.

317. ***BSG Community*** is all about 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. Celebrations were also held during the WSIS in March 2018.

318. 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.

319. 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 September 2019:

- The ITU Regional Standardization Forum (RSF) on "Addressing Competition Issues in ICT Economy" was held in Colombo, Sri Lanka, 1 October 2019.
- The ITU Inter-Regional Standardization Forum on "Operational issues on numbering, emergency service and OTTs" was held in Dubai, UAE, 22 October 2019.
- ITU Regional Standardization Forum (RSF) on "Smart sustainable cities: from concept to implementation", Minsk, Belarus, 3 to 5 March 2020.
- 7th SG13 Regional Workshop on "Standardization of future networks towards Building a better connected Africa", 3-4 February 2020, Abuja, Nigeria.

320. As per Council Resolution 1343, the Radiocommunication Assembly 2019 (RA-19) was held in Sharm el-Sheikh, Egypt, from 21 to 25 October 2019 with 521 participants representing 91 Administrations and 31 Sector Members and 1 specialized agency of the United Nations.

321. RA-19 approved the work programme and Questions of the Radiocommunication Study Groups (see Resolution ITU-R 5, http://www.itu.int/pub/R-RES-R.5) as well as five ITU-R Recommendations.

322. Additionally, two new ITU-R Resolutions were approved, both related to broadcasting issues: **Resolution ITU-R 70** –- Principles for the future development of broadcasting **Resolution ITU-R 71** – Role of the Radiocommunication Sector in the ongoing development of television, sound and multimedia broadcasting.

323. The Assembly also decided to suppress three ITU-R Resolutions: **Resolution ITU-R 34** – Guidelines for the preparation of terms and definitions **Resolution ITU-R 35** – The organization of vocabulary work covering terms and definitions **Resolution ITU-R 43** – Rights of associates.

324. **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[4]; 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

As a result of the free online access policy, ITU-R Recommendations have been disseminated worldwide, becoming a universal reference, reaching all audiences, regardless their economic situation. Currently, there are over 4,000 Recommendations in force on a broad range of topics including service definition to network architecture and security, broadband DSL to

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

Gbit/s optical transmission systems, next-generation networks (NGN) and IP-related issues. All of these topics constitute the fundamental components of today's ICTs.

ITU-R Reports

As ITU-R Recommendations, ITU-R Reports have been disseminated worldwide, becoming a universal reference, reaching all audiences, regardless of their economic situation. More information 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

At its 19th meeting, the RAG invited the BR Director to develop a database, within existing budgetary limitations, that would enable ITU-R Recommendations to be searched and filtered by categories such as the radiocommunication service(s) and applicable frequency band. In collaboration with ITU's IS Department, the search tools for ITU-R Recommendations and ITU-R Questions became operational in October 2015, a search tool for the ITU-R Reports became available.

(l) Internet Governance Forum (IGF)

325. The 15th annual meeting of the IGF was hosted online by the United Nations under the overarching theme Internet for human resilience and solidarity. The programme develops around the four main thematic tracks: (1) Data; (2) Environment; (3) Inclusion; (4) Trust. During the Event, ITU, UNESCO, UNCTAD, and UNDP jointly organized the *First Virtual Meeting of the WSIS Forum Open Consultation Process*, which took place on 6 November 2020. This meeting focused on informing stakeholders and soliciting their suggestions regarding preparations for the WSIS Forum 2021.

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

326. ITU has been actively engaged in and contributing to the UN Secretary-General's activities on digital cooperation. ITU was invited by the Under Secretary-General and Special Advisor to the Secretary-General, working on Digital Cooperation, Fabrizio Hochschild, to join the follow-up activities of the United Nations on Digital Cooperation, especially responding to the Recommendations of the Secretary-General's High-Level Panel on Digital Cooperation.

327. First, together with UNICEF and UNDP, ITU is championing the Digital Cooperation Roundtables on Global Connectivity and Digital Capacity Building. ITU has convened the Roundtables over a series of formal and informal (smaller) meetings to develop multi-stakeholder suggestions to support the achievement of Recommendation 1 A on Global connectivity and Recommendation 2 on Digital help desk of the High Level Panel on Digital Cooperation. ITU is also participating as a key constituent in other Roundtables, such as for Digital Public Goods, Digital Inclusion and Artificial Intelligence, and supporting these Roundtables to shape the global agenda related to the topics.

328. In addition, ITU has organized a series of high-level events on digital cooperation, in partnership with the office of Under Secretary-General/Special Advisor to the Secretary

General, and other leading UN agencies and bodies. For example, to address the emerging issues of ICTs during the COVID-19 pandemic, ITU, together with the USG's office, launched a series of webinars on "Digital Cooperation during COVID-19 and beyond". Since the inaugural webinar on "connectivity assessment", which took place on 15 April, ITU organized the Webinar on different subjects every Wednesday through mid-May. Some 400 people participated, including senior representatives from governments, the private sector, civil society, and international organizations. During the discussion, ITU coined a new terminology – so called "digital distancing" to stop viral misinformation in its track, as well as the urgency of addressing the vulnerability of children online and the rise in cyberthreats.

329. In June 2020, the UN Secretary-General launched the Roadmap for Digital Cooperation, which is a set of recommended actions for the international community to help ensure all people are connected, respected, and protected in the digital age. Since then, ITU has been closely working with the office of the USG/Special Advisor to the Secretary-General, UNICEF, UNDP and other constituents of Roundtables to establish a plan of action(s) to resolve the problems and implement the key actions and proprieties across the eight thematic areas: i) achieving universal connectivity by 2030, ii) promoting digital public goods to create a more equitable world, iii) ensuring digital including for all, iv) strengthening digital capacity building, v) ensuring the protection of human rights in the digital era, vi) supporting global cooperation on AI, vii) promoting trust and security in the digital environment, and viii) building a more effective architecture for digital cooperation, outlined in the Roadmap for Digital Cooperation. There are much more things that we need to do. ITU will continue to play its leading role to implement the Roadmap for Digital Cooperation by further enhancing digital cooperation and collaboration.

(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

330. 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

331. In collaboration and at the rewquest of Stakeholders, WSIS has initiated a number of activities in response to COVID-19 pandemic, as follows:

a. WSIS TalkX

In April 2020, at the request of WSIS stakeholders, the WSIS Team hosted regular weekly virtual WSIS TalkX for the WSIS Stakeholders to interact, connect and collaborate. Each week, Virtual WSIS TalkX explore an aspect of the global response to COVID-19, providing WSIS Stakeholders with a platform to create partnerships for on-the-ground action. Read more in section (d) below here.

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

As 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 Coronavirus (COVID-19) Response – ICT Case Repository* was initiatited 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 call for submissions invited the stakeholders to describe how are they using ICTs to help communities respond to COVID-19, ensuring an impactful use of the WSIS Action Lines in advancing SDGs, and to list projects and activities introduced during COVID-19 to enable efficient continuation of efficient work while creating social impact. The aim of this repository is to help individuals and communities around the world to continue to partner, collaborate and implement in these exceptional pandemic circumstances through the use of information and communication technologies.

The submitted projects were reviewed and featured on the WSIS Stocktaking Platform and promoted through various channels including the WSIS Flash newsletter, WSIS TalkX podcasts and social media channels. The expected impact is to witness the submitted good ICT practices being replicated elsewhere and thus join the collective effort in responding to COVID-19 pandemic and advancing SDGs. A draft zero version of the special ICT Case Repository: The Coronavirus Response is now available.

c. Workshops at WSIS Forum 2020

More than 70 workshops organised by various stakeholders highlighted issues and efforts related to the topic of COVID-19 at the WSIS Forum 2020. Many emphasised the importance of ICTs, in particular internet access and connectivity for all during the COVID-19 pandemic.

(b) Forums

WSIS Forum 2020 Event and its outcomes:

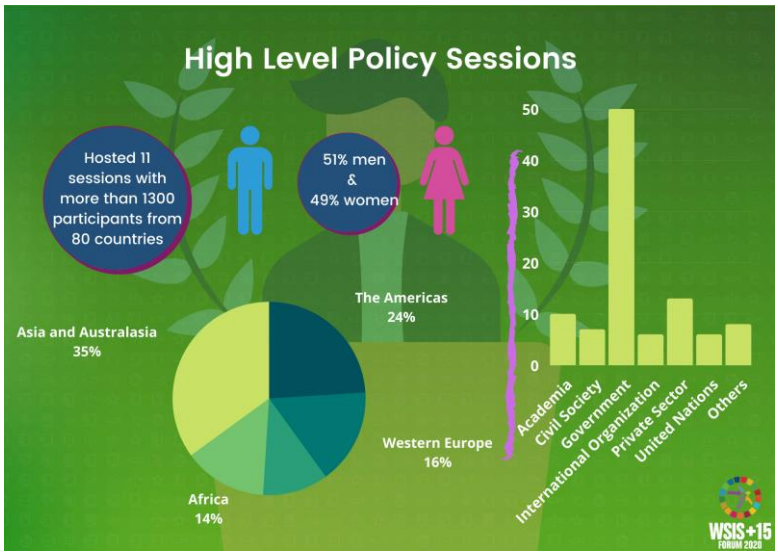
332. The WSIS Forum builds upon the outcomes of the UN General Assembly Overall Review of the Implementation of the WSIS Outcomes (UNGA Resolution A/70/125) that recognized the necessity of holding this Forum on an annual basis and called for a close alignment between WSIS and the 2030 Agenda for Sustainable 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.

333. More than 15,000 information and communication technology (ICT) experts and implementation actors (*accumulative attendance)* contributed to and participated in the virtual WSIS Forum 2020 to foster partnerships, showcase innovation, exchange best practices and announce new tools and initiatives to use ICTs to advance the United Nations' Sustainable Development Goals. More than 85 High-Level speakers representing Ministers, Heads of Regulatory Authorities, Private Sector, Civil Society, Academia and International Organizations contributed passionately towards the program of the Forum. 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.

334. The Chairman of the WSIS Forum 2020 was Dominican Republic. Policy Statements were delivered during the High-Level Policy Sessions (20-29 July 2020) of the WSIS Forum 2020 by high-ranking officials of the WSIS Stakeholder 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 ministerial round table.

335. 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.



336. With the objective of strengthening the alignment of WSIS and SDG processes, the overall theme for WSIS Forum 2020 was " Fostering digital transformation and global partnerships: WSIS Action Lines for achieving SDGs." In particular, in order to highlight the contribution of the WSIS Action Lines in accelerating the achievement of the SDGs, the ITU coordinated, with the UN Action Line Facilitators and all partners, a document that focuses on the impact of the respective Action Lines on the implementation of SDGs. WSIS Forum 2020 (WSIS+15) also served as a platform to track the achievements of WSIS Action Lines in collaboration

with the UN Agencies involved and provide information and analyses of the implementation of WSIS Action Lines since 2005. The evolution of WSIS Action Lines and its implementation for 15 years can be read through the report here. It further seeks to encourage and promote effective multistakeholder cooperation in implementation of WSIS action lines and the Sustainable Development Goals. Each UN agency responsible for facilitating the WSIS Action lines has submitted their input to the report. This document is very well appreciated by the stakeholders following both, the WSIS and the SDGS process to better understand the role and contribution of ICTs and the work done by the different UN Agencies as WSIS Action Line facilitators in that regard.

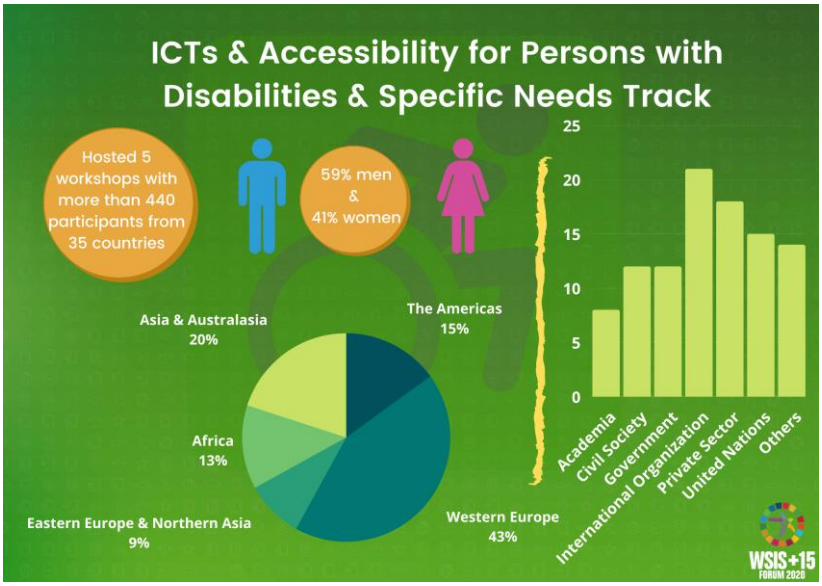
337. WSIS Forum 2020 resulted in several concrete outcomes that will enable stakeholders to strengthen implementation of WSIS Action Lines and the alignment of the WSIS and SDG processes. Please see here:

    1. WSIS Forum 2020 Outcome Document: direct link.
    2. WSIS Forum 2020 High Level Track Outcomes and Executive Brief: direct link.
    3. WSIS Forum 2020: WSIS Action Lines—Contributing towards Accelerated action and transformative pathways: realizing the decade of action and delivery for sustainable development: direct link.
    4. WSIS Stocktaking Report 2020: direct link.
    5. WSIS Stocktaking Success Stories 2020: direct link.
    6. 6 Regional WSIS Stocktaking Reports 2019-2020: direct link.
    7. WSIS Forum 2020 Photo Contest: direct link.
    8. WSIS/SDGs Matrix – WSIS Forum 2020 Outcomes Linking WSIS Action Lines with the Sustainable Development Goals: direct link.
    9. WSIS Stocktaking ICT Case Repository: The Coronavirus Response Special Report: direct link.

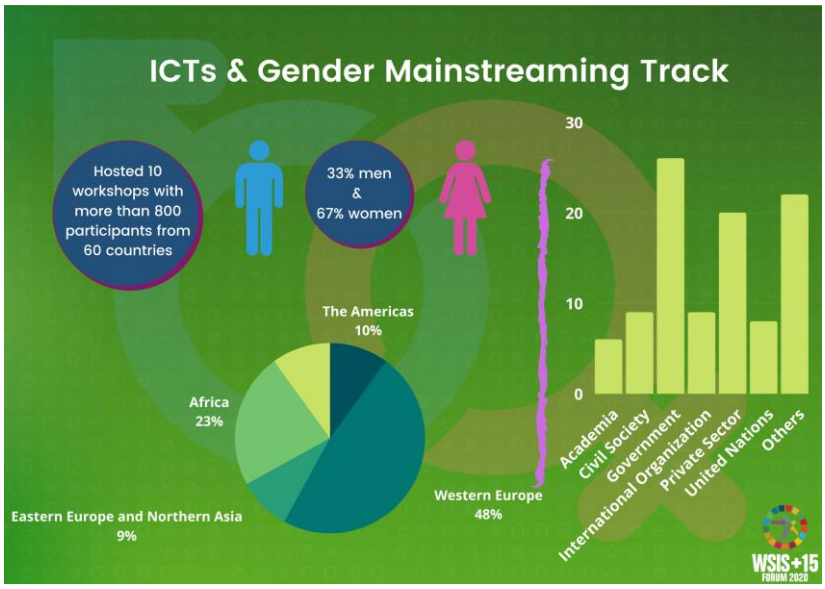
– **Photographs:** WSIS Forum 2020 album: direct link.

338. WSIS Forum 2020 also organised several special tracks, as follows:

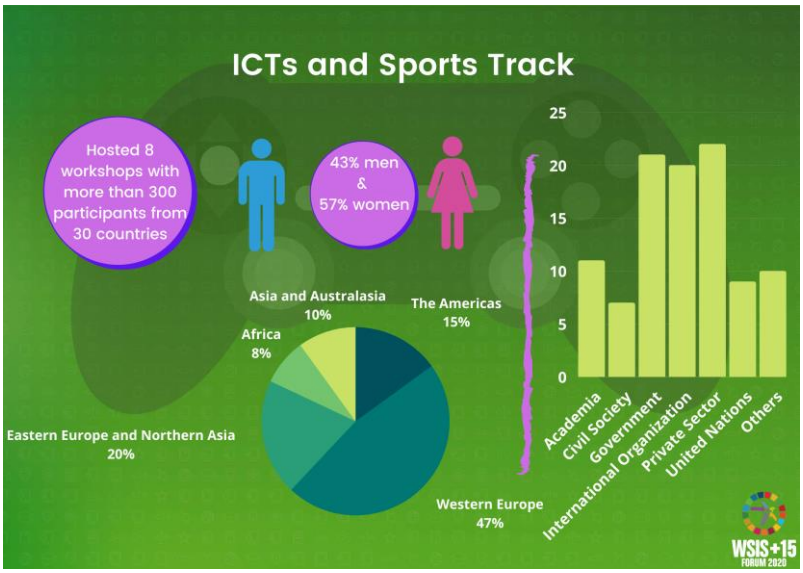
    1. **ICTs and Accessibility for Persons with Disabilities & Specific Needs track**



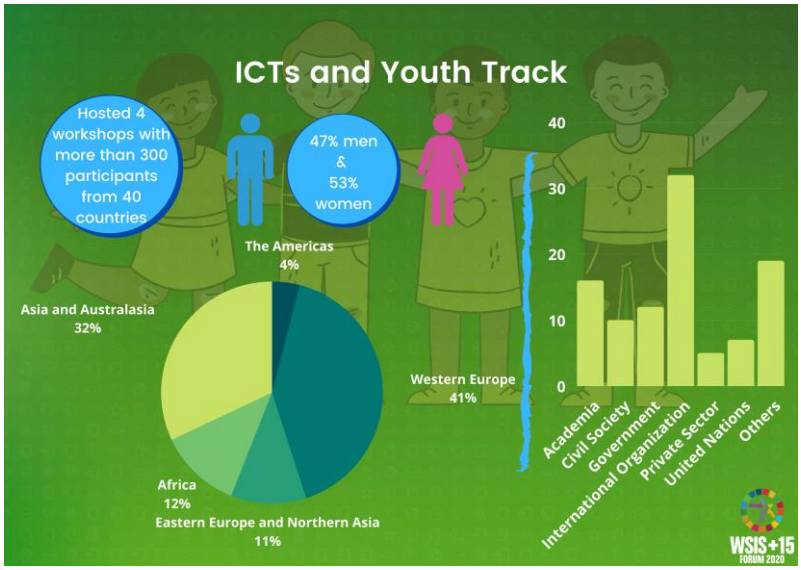
2. **ICTs and Gender Mainstreaming track**



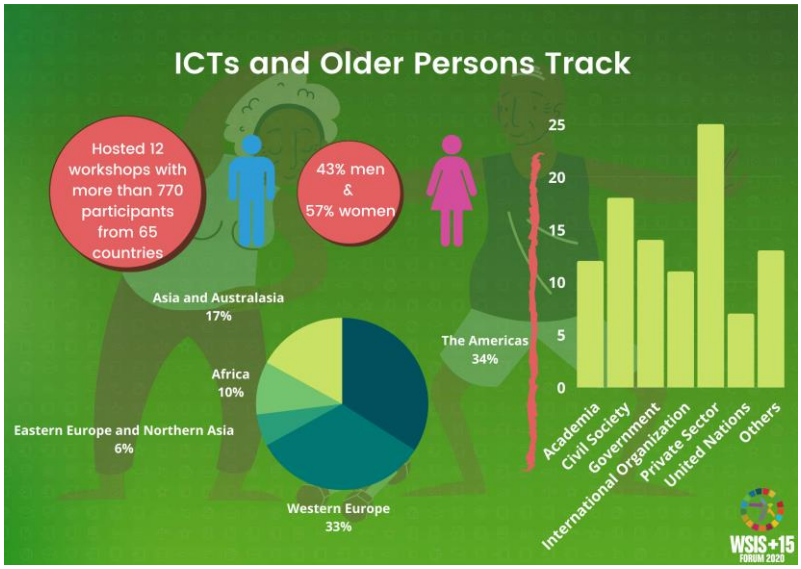
3. **ICTs and Sports track**



4. **ICTs and Youth track**



5. ICTs and Older Persons track



339. **<u>WSIS Forum 2020: Key Achievements (Announcements, Launches, Agreements, Commitments)</u>**

Please find below some key achievements of the WSIS Forum 2020:

- UN Group on the Information Society (UNGIS) reiterated commitment to the WSIS Action Lines implementation and alignment of the WSIS and SDG processes, with contributions to the High-level Political Forum (HLPF) 2020; submitted a written contribution and held a side-event at the HLPF 2020 (www.ungis.org). UNCTAD assumes the Chair of UNGIS for the year 2020-2021. As the current Chair of UNGIS, UNCTAD has initiated a Dialogue on the Role of Digitalization in the Decade of Action to raise awareness of both the importance of digitalization in achieving the SDGs and of the unique opportunity that UNGIS presents for more effective collaboration in this area within the UN System.

- UN Regional Commissions organised a series of workshops to highlight the regional activities in implementing the WSIS Action Lines for the Agenda 2030 Sustainable Development Goals. Many announcements have been made calling on all regional partners and stakeholders to join forces and collaborate in joining upcoming WSIS-related events and activities. WSIS will be continue to be included in the UN Regional Coordination Mechanisms and WSIS4SDG will become one of the pillars of the regional SDG Forums. UN ECLAC was nominated as the Chair of the WSIS UN Regional Commissions group for 2020-2021.

- Dominican Republic, Chair of the WSIS Forum 2020, has been nominated as the Chair of the ITU-Group of Latin American and Caribbean Group (GRULAC).

- Launched the first ever ICTs and Older Persons track at the WSIS Forum 2020. The reference of this activity was included in the Secretary General Report “Follow-up to the International Year of Older Persons: Second World Assembly on Ageing” submitted pursuant to General Assembly Resolution 74/125. Para 42: Another barrier to the

participation of older persons in the labour force are labour markets that do not offer the flexibility that would benefit older persons. Offering flexible and part-time work arrangements, which are highly valued by older workers, as well as exploiting the potential of new digital technologies, including robotics and artificial intelligence, to support employment among older persons can incentivize older workers to extend their working lives. While information and communications technologies (ICT) have become ubiquitous in the economic and social life of both developed and developing countries, digital divides continue to prevent ICT from achieving their full development potential, particularly in the least developed countries (see A/75/62-E/2020/11). Highlighting the importance of older persons as a cross-cutting topic, in 2020 the World Summit on the Information Society Forum, for the first time, has dedicated a special track to older persons and ICT. In collaboration with relevant stakeholders, the new track will address the role of ICT 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.

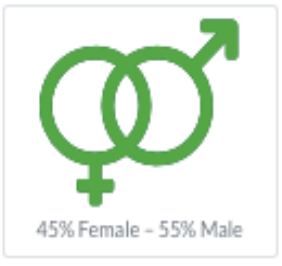
- UNDESA has launched United Nations E-Government Survey 2020. Since its inception in 2001, the United Nations E-Government Survey has become an indispensable "ranking, mapping and measuring" tool for policymakers and analysts engaged in comparative analysis and contemporary research on e-government.

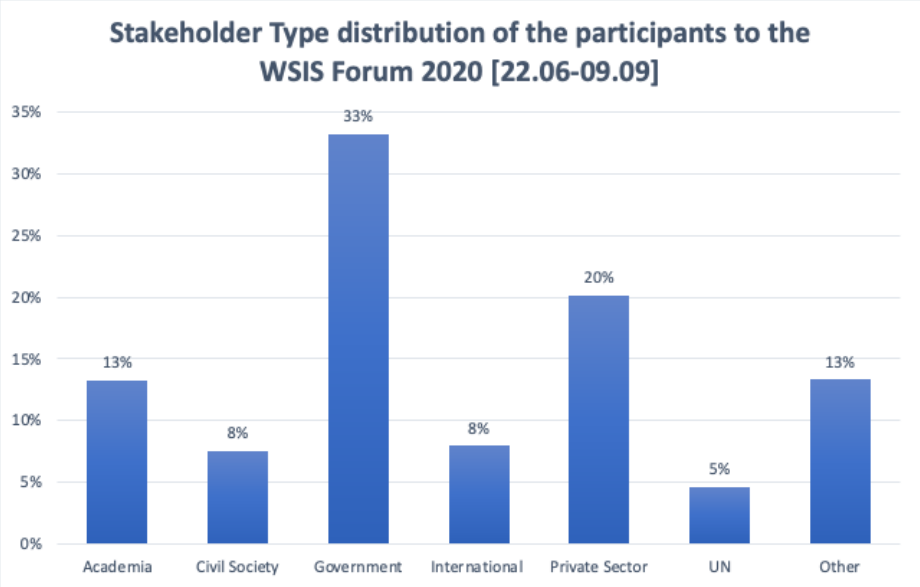
- Strengthened the engagement with ITU Study Groups in line with the WSIS Process

- Ministerial Round Table participants committed to bridging the digital divide and connecting the unconnected.

- ITU and University of Geneva collaborated for the virtual Hackathon through the Open Seventeen Summer Challenge.

340. **<u>WSIS Forum 2020 Participation:</u>**





341. **WSIS** Forum **2020:** Photo **Contest**

342. For the WSIS Forum 2020 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 4 June 2019 and collected photos until 3 February 2020. During this period, people were sending photos of their projects, people, and organizations that are leveraging the power of ICTs to make difference.

343. The three winning entries in the WSIS photo contest were unveiled at the WSIS Forum 2020. A dedicated poster and other campaign materials highlighting their work were created and shared within ITU and its stakeholders.

344. **WSIS Forum 2020 Photo Contest Winners:**

1) Confident tea-garden worker

A tea-garden worker who works in the garden can now-a-days maintain the connectivity with her domestic front very easily with the help of mobile-telephony. This augments her performance on the field as she gets less disturbed and more concentration because of reduced home-front hassles. This also keeps her jovial and less-fatigued in her vast working-atmosphere as she also can have her favourite tunes during her job by playing from her handset.

2) The digital revolution in rural Nigeria

Digital inclusion at work in rural Nigeria. The latest farming info is affordably arriving through smart feature phones.

3) Playful Learning with Tech Resources

In the lush Doon Valley of the Lower Himalayas, children in Balsabhas, or learning groups, are taught important life skills, like how to value their environment through sustainable practices and how to use modern tech. The child pictured here has creatively combined these lessons by building a makeshift smartphone speaker with recycled materials.

(c) WSIS Action Lines and SDGs Matrix

345. 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".

346. 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.

347. 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.

348. 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.

349. 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).

350. 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.

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

352. 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

353. 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 at the request of stakeholders as a continuous virtual series since April 2020. More than 30 physical and virtual sessions have been conducted, which have all been adapted to podcasts and are available to listen and download at WSIS TalkX Podcast here.

354. 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.

(e) WSIS Prizes

355. 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 2020 contest.

356. 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.

357. 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 2020 reflect 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.

358. Facilitated by ITU in coordination with all WSIS stakeholders, the WSIS Prizes 2020 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 seventh year in a row, the World Summit on the Information Society (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 2020 winners and champions' dedication and commitment in the implementation of the WSIS Outcomes, while honoring the outstanding projects from the international WSIS community.

359. These highly sought-after awards recognize outstanding initiatives from governments, the private sector, civil society and academia that channel the contributions of information and communication technologies (ICTs) towards the betterment of society.

    Now in its ninth edition, the WSIS Prizes winners represent the year's most innovative and high-impact projects from around the world that demonstrate the vital role of ICTs in achieving the United Nations' Sustainable Development Goals.

ICT Projects submitted to WSIS Prizes 2020 are tightly linked with the UN Sustainable Development Goals. Image source: WSIS Stocktaking.

360. So far, around 4,000 ICT projects were nominated for the WSIS Prizes contests since 2012 with 522 projects being awarded: 162 best practices were recognized as the WSIS Prizes Winners, while 360 projects were awarded as the WSIS Prizes Champions since 2016 (the year we started recognizing the runner-up projects as well).

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

This year, a record number of 806 projects were submitted by the WSIS community around the world. Of these, 776 projects were nominated after the deliberation of the Expert Group. From there, 90 Champions were selected based on over two million votes cast by WSIS stakeholders.

362. ITU announced 90 Champions of the prestigious WSIS Prizes contest in February this year, while the 18 Winners, out of these 90 Champions, were recognized at a virtual ceremony during the Final Week of the WSIS Forum 2020 on 7 September 2020

363. In 2020 contest, the 90 WSIS Prizes champions were recognized through the Online Voting phase, with more than 2 million votes received from the WSIS Community during the Online Voting Phase from more than 120,000 voters from around the world. 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 runner-ups are WSIS Prize Champion.

364. **Meet the winners**

From open data to digital clinics, to highlighting the voices of women and youth in media, the 2020 WSIS Prizes 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 Action Line:

Action Line C1 - *The role of government and all stakeholders in the promotion of ICTs for development*	Winner: Digital Clinic, Infocomm Media Development Authority, Singapore
Action Line C2 - *Information and communication infrastructure*	Winner: Digital Inclusion - Free WiFi, Agencia Digital de Innovación Pública, Mexico

Action Line C3 - *Access to information and knowledge*	Winner: UAE Infrastructure Geo-spatial Platform, Ministry of Energy and Infrastructure, United Arab Emirates
Action Line C4 - *Capacity building*	Winner: Siberkreasi (Indonesia's National Movement for Digital Literacy), Siberkreasi, Indonesia
Action Line C5 - *Building confidence & security in the use of ICTs*	Winner: Global Accredited Cybersecurity Education Scheme: Centre of Excellence for Capacity Building and Lifelong Learning, CyberSecurity Malaysia, Malaysia
Action Line C6 - *Enabling environment*	Winner: Start-up Tunisia, Ministry of Communication Technologies, Tunisia
Action Line C7 - *E-government*	Winner: Sabooj Sathi Online 3.0, Backward Classes Welfare Department, India
Action Line C7 - *E-business*	Winner: Business Digital Transformation Centers, Ministry of Information and Communication Technology, Colombia
Action Line C7 - *E-learning*	Winner: The First International CyberSchool of the future for the new IT generation, KIBERone, Russian Federation
Action Line C7 - *E-health*	Winner: Early Diagnosis of Breast Cancer using Artificial Intelligence (AI), Ministry of Health, Oman
Action Line C7 - *E-employment*	Winner: Recruitment Process Management as a Shared Service for Govt Agencies of Bangladesh, Bangladesh Computer Council, Bangladesh
Action Line C7 - *E-environment*	Winner: China Unicom “Smart Blue” public service big data platform, Network Intelligent Operation Research Center of China Unicom Research Institute, China
Action Line C7 - *E-agriculture*	Winner: Eyes in the Sky, Smart Techs on the Ground, Technical Centre for Agricultural and Rural Cooperation ACP EU, Netherlands

Action Line C7 - *E-science*	Winner: Open Data Policy and Portal, Ministry of Transport and Communications, Qatar
Action Line C8 - *Cultural diversity & identity, linguistic diversity*	Winner: Attaa initiative (العطاء الرقمي), Ministry of Communications and Information Technology, Saudi Arabia
Action Line C9 - *Media*	Winner: Voices of Women Media, Voices of Women Media, Nepal
Action Line C10 - *Ethical dimensions of the Information Society*	Winner: ICT and Media: Efficient tools for youth to Counter Violent Extremism, Ghana Investment Fund for Electronic Communications, Ghana
Action Line C11 - *International & regional cooperation*	Winner: Asociación Innovactoras, Spain

The WSIS Prizes winners pose with ITU Secretary General Houlin Zhao. The photographs in the above composite were digitally produced, with each winner photographed separately. All social distancing guidelines were respected. Image credit: ITU

Detailed descriptions of all WSIS Prizes 2020 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 multi-stakeholder 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.

365. 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.

366. All stakeholders are urged to encourage their networks to join the WSIS Prizes process, including the multistakeholder open consultation process for the WSIS Forum 2020, in order to ensure that all features correspond to the real needs of the WSIS implementation process towards 2025. Phase one will open the call for submissions to the contest of the WSIS Prizes 2020. All stakeholders are invited to submit WSIS related projects to the WSIS Prize 2020 contest. In order to process the submission, stakeholders are requested to complete the submission form for WSIS Prize 2020 online at www.wsis.org/prizes by deadline 20 November 2020.

367. 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 2021:

368. ITU is pleased to announce that the WSIS Prizes 2021 Call, 10th 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.

369. Phase 1 will open the call for submissions to the contest of the WSIS Prizes 2021. During this phase, all stakeholders are invited to submit WSIS related project to the WSIS Prizes 2021 contest.

(d) WSIS Stocktaking Portal

370. 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.

371. 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. The platform offers stakeholders exciting and interactive networking opportunities via Web 2.0 applications.

372. 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 guidelines of the WSIS Stocktaking process.

373. 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.

374. 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 (SDGs).

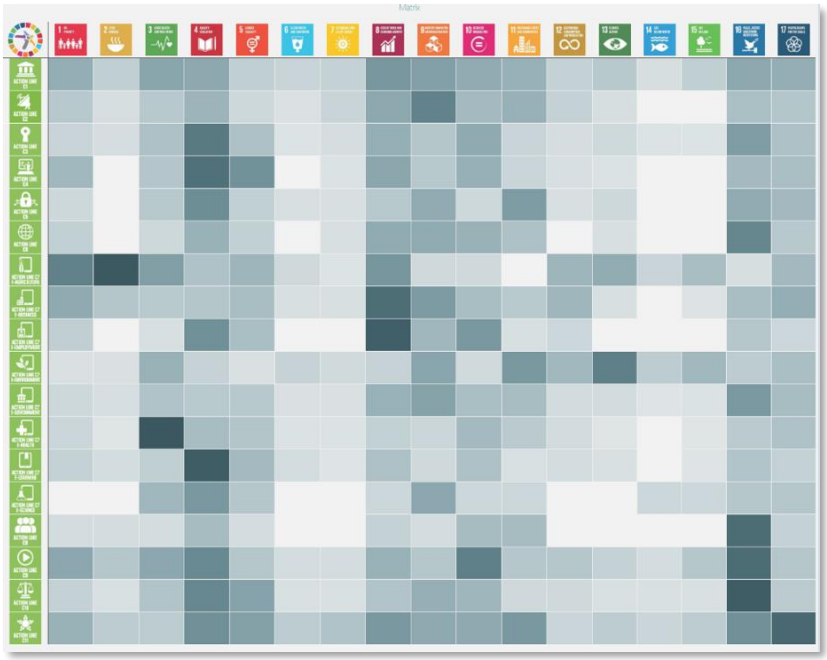
375. The direct linkages between the WSIS action lines and the SDGs set out below are crucial to continuing to strengthen the impact of ICTs for sustainable development. Each UN action line facilitator has analyzed the connections and relations between their respective action lines and the proposed SDGs 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.

376. 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.

377. 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 350,000 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 12,000 entries so far. This encouraging outcome reinforces stakeholders' belief in and commitment to the WSIS Stocktaking process and their desire to share best practices.

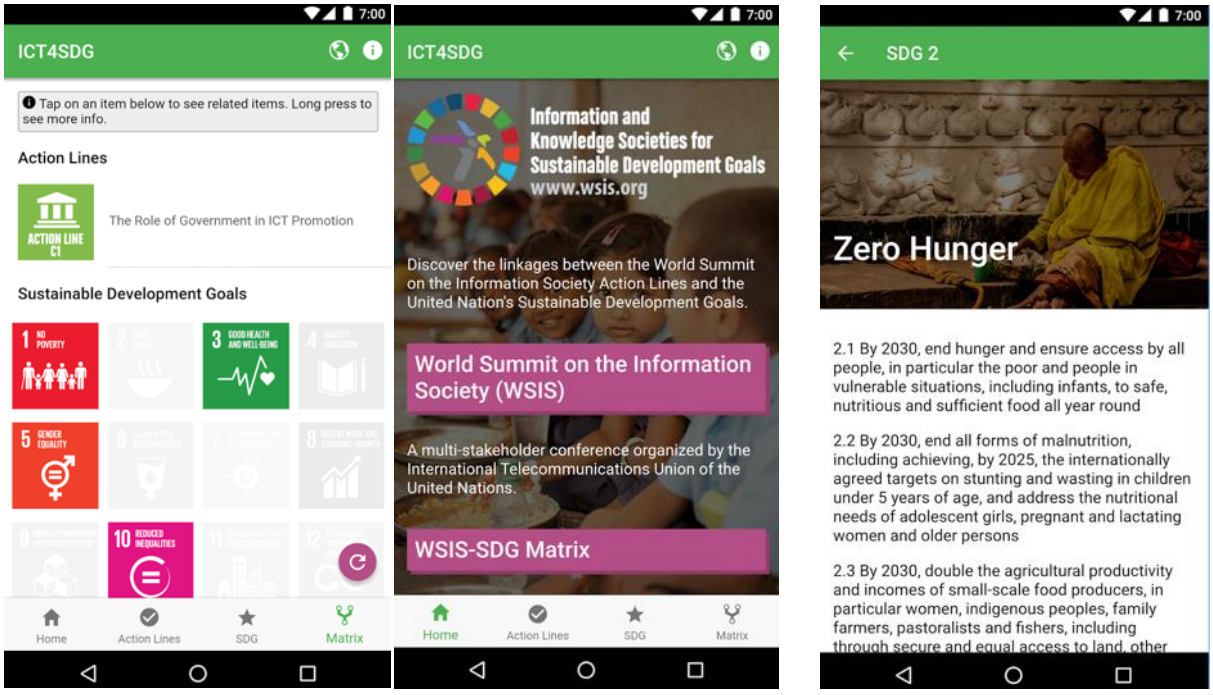
378. New WSIS Stocktaking products were introduced in 2019 with positive feedback from the WSIS stakeholders who showed much interest in using them. One such products has been designed in a form of an interactive matrix that is to be used as a graphical representation of WSIS and SDG data collected through the implementation of the WSIS Stocktaking process, where the individual values contained in a matrix are represented colorfully:



379. 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.

380. 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.



381. 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

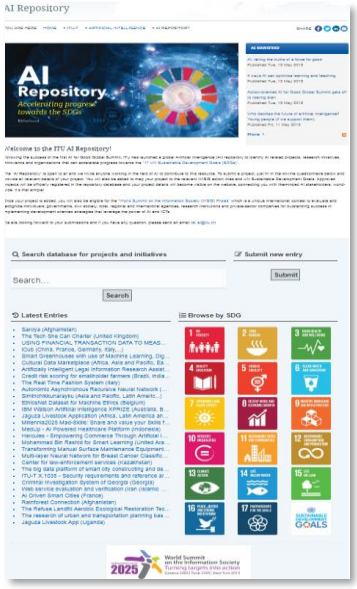
stories. Thanks to this interface, the visitors are able to view live entries (live results are customizable upon a particular WSIS Action Line or SDG or region or other data focus relevant to the user), search the WSIS stocktaking database within partners' websites environment, and to submit ICT-related 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

382. We encourage all WSIS Stakeholders to consider using this 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

383. 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.



384. 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.

385. 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.

386. 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 12,000 entries and a growing up community of 350,000 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.

387. The new call for update and new entries 2020-2021 is now open and we invite you to submit entries online at www.wsis.org/stocktaking. Submitted activities will be reflected in various forms in the WSIS Stocktaking 2021 (reports, exhibitions, videos etc.) which will be released at WSIS Forum 2021 to be held on 17-21 May 2021 at ITU headquarters, Geneva. We look forward to receiving your responses to this call.

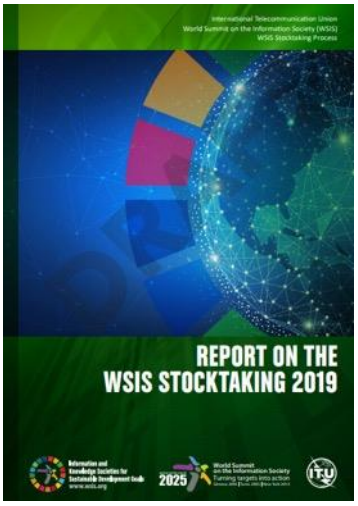
(e) WSIS Stocktaking Publications

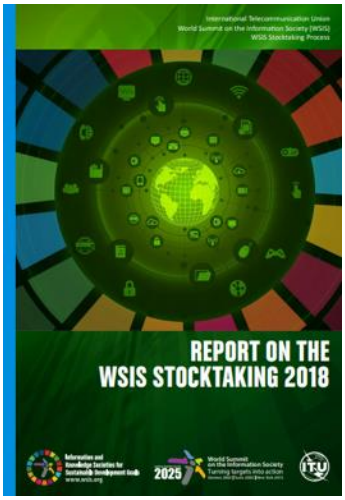
388. This year, **776 ICT-related projects** from around the world were submitted for the Report on the WSIS Stocktaking 2020 by the WSIS Stakeholder community. The tenth edition of the Report on WSIS Stocktaking set a new record of global multistakeholder engagement in implementation of WSIS action lines for SDGs. The Report was presented during the Final Week of the virtual WSIS Forum 2020, 7-10 September 2020. At the same occasion, an interactive session was dedicated to the presentation of the results of this year's WSIS Stocktaking and to listening to the voices of the WSIS stakeholders' community on how to improve the process in the future.

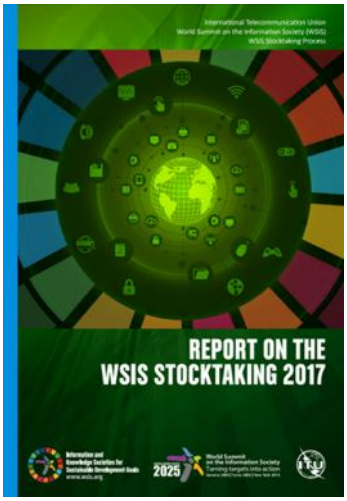
389. The 2020 edition of the Report on the WSIS Stocktaking is the continuation of the series. This twelfth edition reflects 776 activities relating to ICTs for development, submitted to the WSIS Stocktaking Platform from July 2019 to December 2019, each one highlighting the efforts deployed by stakeholders 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 2019 for Stocktaking updates and new entries. The inputs from WSIS action line facilitators and co-facilitators also contributed to the present Report.

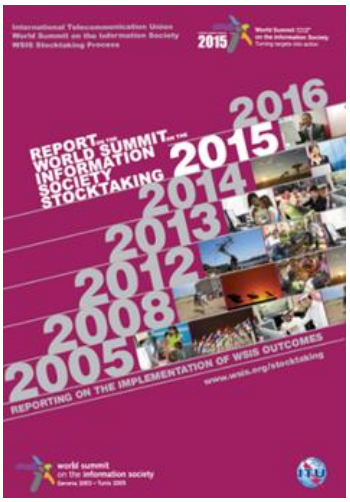
390. Since the WSIS Stocktaking Process was established, twelve editions of global WSIS Stocktaking Reports have been published, providing an overall picture of progress and an insight into latest WSIS-related activities. Since the 2016 Report, all reports also focused on contributions by stakeholders worldwide to WSIS and Sustainable Development Goals. The 2019 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.

391. All WSIS-related publications, including the WSIS Stocktaking reports (2004-2020), are available to download at the ITU Bookshop.


REPORT ON THE
WSIS STOCKTAKING 2019


REPORT ON THE
WSIS STOCKTAKING 2018


REPORT ON THE
WSIS STOCKTAKING 2017


REPORT ON THE WORLD SUMMIT ON THE INFORMATION SOCIETY STOCKTAKING
2016
2015
2014
2013
2012
2008
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REPORTING ON THE IMPLEMENTATION OF WSIS OUTCOMES
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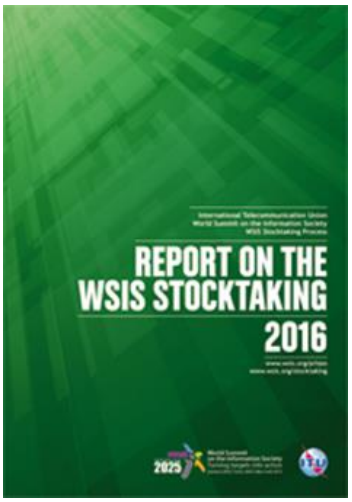
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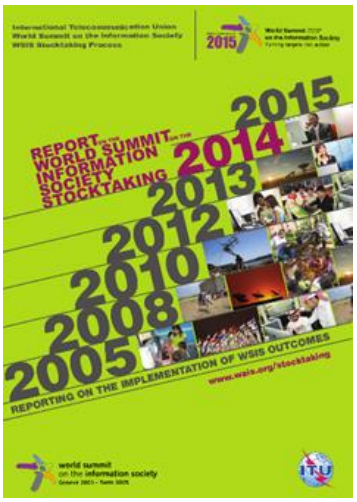
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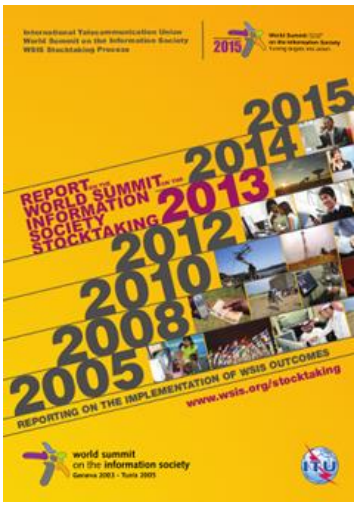
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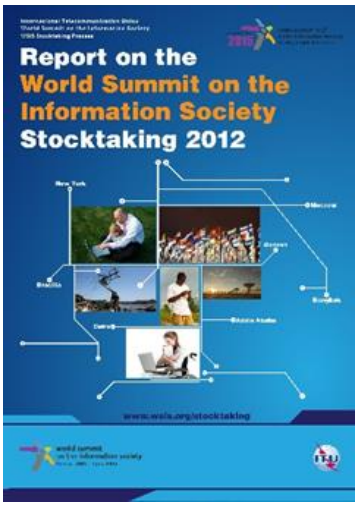
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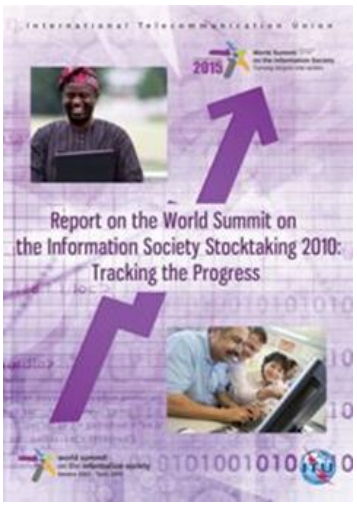
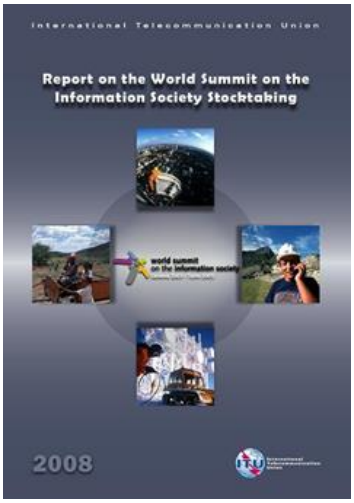
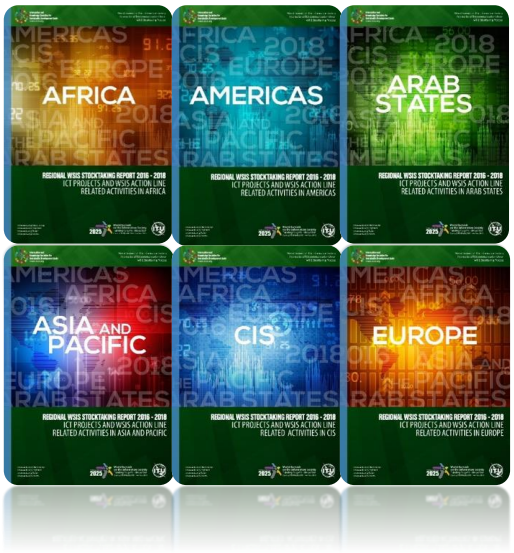

Report on the World Summit on
the Information Society Stocktaking 2010:
Tracking the Progress



392. WSIS Stocktaking continues to also report on the progress made in the six ITU regions: Africa, Americas, Arab States, Asia and Pacific, CIS, and Europe. Following the first series of the WSIS Stocktaking Regional Reports portraying projects submitted in the period 2014-2016, and 2016-2018, the third series of Regional WSIS Stocktaking Reports were produced for the period 2019-2020 and presented during the WSIS Forum 2020. All WSIS Stocktaking publications are available at the ITU Bookshop.



393. The 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.

394. 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 Competition 2020

395. 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 first three 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 10 February 2019.

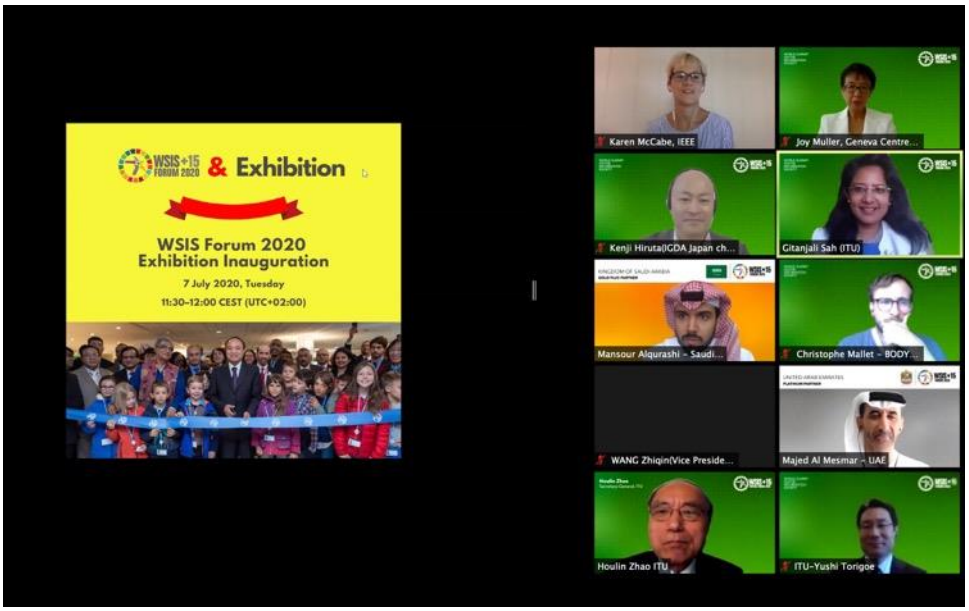
396. WSIS Forum invited the community to picture how Information and Communication Technologies (ICTs) are playing an enabling role in achieving the Sustainable Development Goals (SDGs). Photographers from around the globe were invited to share photo submissions that demonstrate this year's theme of "Information and Communication Technologies for achieving the Sustainable Development Goals".

397. The three winning entries in the WSIS photo contest were announced at the WSIS Forum 2020. Please see here for more information: https://www.itu.int/net4/wsis/forum/2020/PhotoContest.

(g) Exhibition

398. WSIS Forum 2020 gathered more than 130 exhibitors from Civil Society, Academia, International Organizations, Private Sector, and Governments. The virtual 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.

399. The virtual exhibition was inaugurated by the Secretary-General of ITU, Mr. Houlin Zhao, accompanied by the WSIS Forum 2020 Platinum Partner representative H.E Majed Sultan Al Mesmar, Deputy Director General of the Telecommunications Regulatory Authority (TRA) of the United Arab Emirates, as well as the Gold Plus Partner represented by H.E. Dr. Mohammed Altamimi, Governor, Communications and Information Technology Commission (CITC), and one of the Partners for Specific Activities, IEEE, represented by Ms. Karen McCabe, Senior Director Public Affairs and Marketing. Joining the inauguration were four other exhibitors, who briefly presented their ICT-enabled projects and initiatives.



400. WSIS Forum 2020 virtual exhibition can be seen here: https://wsisforum2020.pathable.co/exhibitors-partners

(h) Hackathon

401. WSIS Forum 2020 Hackathon is collaborating with the Open Seventeen Summer Challenge towards Innovating for a Sustainable Post-Pandemic WorldHackathon Winners.

402. The Open Seventeen Summer Challenge from 6–31 July coaches teams of high-school, undergraduate and master students from all fields of study. The focus of this online month-long event is on achieving real-world impact while learning about crowdsourced innovation methodologies. Specific challenges include frugal medical equipment, crowdsourced health research, post-pandemic environmental sustainability, tackling unemployment, helping the elderly and reinventing remote collaboration. Top teams win weekly prizes to accelerate their projects. Interested students or student team should apply by 10 June. Partnering Universities : University of Geneva, University of Paris, Politecnico di Milano, University of Zurich, ETH Zurich, New York University, Tsinghua University. Supported by: the EC Horizon 2020 project Crowd4SDG and the Geneva Tsinghua Initiative. Further information is available here.

(i) The Global Cyber Security Agenda (GCA)

403. 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.

(j) Connect 2030 Agenda for global telecommunication/ICT development

1. Background

404. 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.

405. 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.

406. 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

407. Section 2.b of Annex 2 to Resolution 71 (Rev. Dubai, 2018), "Situational Analysis", provides an analysis on the progress of the targets of the precedent Connect 2020 Agenda (a set of 17 targets included in the Strategic Plan 2016-2019 adopted at PP-14), based on the indicators and statistics collected and provided by the Telecommunication Development Bureau and other sources. The latest progress towards this former Connect 2020 Global Telecommunication/ICT Targets are presented in the 2018 Report on Implementation of the Strategic Plan and Activities of the Union presented to Council 2019.

408. Regarding the Connect 2030 Agenda, during the World Telecommunication and Information Society Day 2020 (WTISD 2020) a microsite was launched as a new way to provide a dashboard for both the goals and targets, as well as to provide relevant links to publications, data and other resources, so that ITU and its members can progress together towards connecting the world.

409. The five goals of the Connect 2030 Agenda (Growth, Inclusiveness, Sustainability, Innovation and Partnership) include 24 targets, designed to provide an indication of progress towards the achievement of the goals up to 2023. Roadmaps and methodologies have been developed and some are still under consideration by the ITU Statistics Dept., in order to be able to report on the progress achieved towards those targets.

410. A first progress report is contained in the Report on the implementation of the Strategic Plan and activities of the Union, April 2019 – April 2020 that was presented to Council 2020 Virtual Consultation, and also an interactive version is available online.

Operationalization of the ITU Strategic Plan 2020-2023

411. 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

412. 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

413. 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.*

3. Measurement and reporting status of Connect 2030 Agenda goals and targets

414. The Connect 2030 Agenda targets will be measured in a yearly basis as from 2020, and its progress can be seen in the Connect 2030 Agenda microsite as well as in the ITU Annual Report.

Goal / Target
GOAL 1: GROWTH – Enable and foster access to and increased use of telecommunication/ICTs in support of the digital economy and society
• 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 for all

- 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

- 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

- Target 4.1: By 2023, all countries should have policies/strategies fostering telecommunication/ICT-centric innovation

1

Goal 5 – PARTNERSHIP: Strengthen cooperation among the ITU membership and all other stakeholders in support of all ITU strategic goals
• **Target 5.1: By 2023, increased effective partnerships with stakeholders and cooperation with other organization and entities in the telecommunication/ICT environment**

(k) Broadband Commission for Sustainable Development

415. 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, and sustainable broadband communications services that are reflective of human and children's rights.

416. 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.

417. 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.

418. Every year, the UN Broadband Commission 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. This year, broadband adoption has accelerated and an unforeseen pace as it has emerged as the hidden hero in the global battle against the COVID-19 pandemic. In 2020 almost half the global population still has no access to the online world with about 46.4% of the world being unconnected. The digital divide has been highlighted as a key barrier to the power of digitization to mitigate the COVID pandemic disruption, bringing the work of the Commission to the forefront.

419. Over the course of 2020, the Broadband Commission pursued a range of work through its Working Groups on: School Connectivity, AI & Health, and Freedom of Expression and addressing Disinformation, each of which published a report in 2020. The Commission launched further Working Groups for the next year to be focused on among other topics

on and the 21st Century Financing models for Broadband, Epidemic Management and Digital Learning.

420. By issuing these reports, the UN Broadband Commission for Sustainable Development has made a worthy contribution to the debate about how best to expand broadband access and services and how to achieve digital inclusion for all. The Commission will continue working with many different stakeholders to achieve universal connectivity towards the forthcoming Sustainable Development Goals (SDGs).

421. In addition to these reports, the Commission maintains an online portal with a wealth of online resources, country case studies, best practices and regulatory information, as well as the publicly available newsletter.

422. In addition to its Working Group activities, the Broadband Commission, hosts two regular face-to-face meetings each year to solicit feedback from regional constituents, including ministers and regulators, as well as members of the private sector. At this meeting, 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.

423. On 3 April 2020 in lieu of its Annual Spring meeting, the Broadband Commission held a virtual Emergency Session in response to the onset of the COVID pandemic. At this meeting, the Commission announced its adoption of the Agenda for Action, outlining immediate measures that governments, industry, the international community and civil society can take to shore up digital networks, strengthen capacity at critical connectivity points like hospitals and transport hubs, and boost digital access and inclusivity with the aim of strengthening collective response to the COVID-19 crisis sweeping the world. Built around three pillars: Resilient Connectivity, Affordable Access, and Safe Use for Informed and Educated Societies, the agenda serves as a framework for the Commission's 50+ Commissioners and their organizations to share their own initiatives, make new commitments, and foster collaboration and partnership.

424. On 18 September 2020 the Commission held its Annual Fall Meeting virtually due to the COVID pandemic. The meeting was marking a milestone of the 10 years of the Broadband Commission and coincided with 75th session of the General Assembly. The Annual Fall Session served as a platform for Commissioners to share progress through the flagship State of Broadband Report, Working Groups publications, and closed by reaffirming the Commission’s commitment to universal connectivity with the publication of the 2020 Manifesto.

425. This meeting committed to concrete actions that will advance the roll-out of broadband around the world – and with it, much-needed digital connectivity, which is in direct alignment with the UNSG’s Roadmap for Digital Cooperation to accelerate progress towards the United Nations Sustainable Development Goals (SDGs).

426. In 2020 the Commission participated in a session at the WSIS Forum 2020 entitled, Building Back Better with Broadband: The Importance of Connectivity for COVID-19 Recovery and Preparedness for the 'New Normal', as well as the UN High-Level Political Forum on

Sustainable Development 2020 with a virtual session on "Pathways towards universal access for resilient connectivity in the LDCs and landlock countries " which served as the platform to share and explore the measures being taken by UN Agencies, governments and the digital industry to ensure resilient connectivity, access and use, adapting to new realities. The session included the lessons learned presented by the leaders and best practices of public-private partnership and digital cooperation which led to enable connectivity for the most vulnerable and unconnected populations, identifying measures to connect the remaining unconnected people addressing the specific needs of the LDCs and landlocked countries.

(I) AI for Good Global Summit

Introduction

427. 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

428. 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.

429. 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.

(m) Girls in ICT Day

430. ITU's flagship Girls in ICT Day raises visibility on the importance of attracting women and girls to ICT studies and careers. In 2020, International Girls in ICT Day was celebrated on 23 April. A "24h World Tour of Girls in ICT Day celebrations highlights" featured some of the virtual celebrations taking place all over the world during the Day. ITU hosted an online dialogue on Girls in ICT: Inspiring the Next Generation. The online dialogue highlighted the importance of governments' engagement in empowering women through technology and drew attention to role models and mentors and how they can inspire girls and young women to take up careers in the tec h field.

(n) Equals in Tech Awards -2020

431. The Equals in Tech Awards initiative is designed to promote gender equality and mainstreaming in technology. The awards are part of EQUALS, an ITU and UN Women global partnership working to achieve gender equality in the digital age – with the support of a growing list of partner companies and non-governmental organizations. In addition to supporting gender equality in the ICT field and advancing the role of women as ICT decision-makers, the awards also showcase how ICTs can be used to dramatically improve social, political and economic outcomes for women and girls.

432. The Equals in Tech Awards also bring valuable attention to all nominees and the important work that they are doing to bring tech to women and women to tech. As such, nominations are encouraged from all sectors – governments, companies, non-profit organizations, individuals, etc.

433. The nominated initiatives will be judged by a distinguished panel of partners and previous winners, recognized as Equals in Tech Advisors. Members include former award winners, and representatives of EQUALS Partners: ITU, UN WOMEN, International Trade Center.

434. The Equals in Tech Awards are presented in five categories:

Access: The Access Category recognizes individuals and initiatives working to improve women's and girls' digital technology access, connectivity and security

Skills: The Skills Category recognizes individuals and initiatives supporting development of science, technology, engineering and math skills of women and girls so that they can participate fully in an increasingly digital world.

Leadership in Tech: The Leadership in Tech Category recognizes individuals and initiatives working to close the gender gap in representation and decision-making roles in the technology sector.

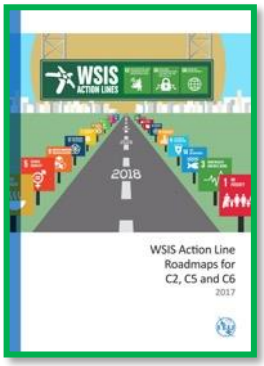
Leadership in SME: The Leadership in SME Category recognizes individuals and initiatives that promote women's leadership and entrepreneurship in small and medium enterprises (smes) in the tech sector.

Research: The Research Category recognizes individuals and initiativesworking to expand digital gender divide knowledge in support of evidence-based decision-making

435. The five winners were announced by the EQUALS Global Partnership in a virtual ceremony on 6 November 2020 for their innovative work promoting gender equality in internet access, digital skills and tech leadership. For more information about the EQUALS initiative and awards, visit: www.equals.org.

(o) Roadmaps for WSIS Action Lines C2, C5, C6

436. 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).



437. 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:

438. 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;

439. 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;*

440. 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.

441. 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.

442. 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.

(p) Communication and Outreach

443. WSIS Flash: is a monthly newsletter on WSIS Related news, projects and activities. https://www.itu.int/net4/wsis/stocktaking/Flash/Newsletter

444. 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

445. 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

446. WSIS Process on Facebook: The WSIS Facebook page gives opportunity to fans to get informed and actively contribute to the page http://www.facebook.com/WSISprocess

447. @WSISprocess on Twitter: The WSIS Twitter page gives opportunity to fans to get informed and actively participate at the page https://twitter.com/WSISprocess\

448. 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.

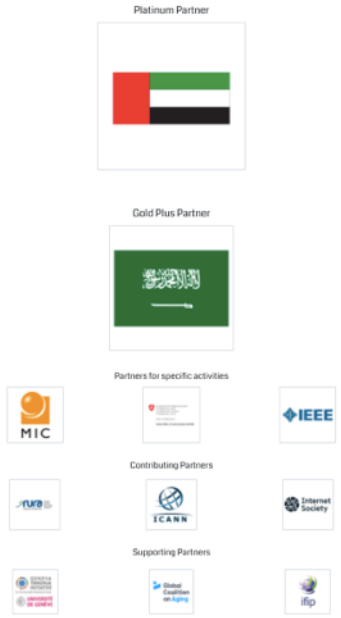
449. WSIS Process on LinkedIn: WSIS Process has a LinkedIn group: https://www.linkedin.com/groups/WSIS-Process-World-Summit-on-2599279?gid=2599279&trk=hb_side_g .

450. 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/

451. 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/

(q) WSIS Fund in Trust

452. 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.



453. 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 multi-stakeholder approach, the WSIS Forum will build upon the outcomes of the WSIS+10 Review and the 2030 Agenda for Sustainable Development.

454. 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

455. We thank United Arab Emirates, Saudi Arabia, Japan, Switzerland, IEEE, Rwanda, ICANN, Internet Society, University of Geneva – Geneva-Tsinghua Initiative, IFIP, and Global Coalition on Aging (GCOA) for their contributions to the WSIS Fund in Trust in 2020 to accelerate the implementation of the WSIS related activities undertaken by ITU.

(r) Future Actions

456. The WSIS Forum 2021 is scheduled to be held from 17 to 21 May 2021 at the ITU Headquarters, Geneva. The agenda and program will be built on the basis of submissions received during the Open Consultation Process. Additional information about the WSIS Forum 2021 is available here.

457. **1) WSIS Forum 2021 (Open Consultation Process) www.wsis.org/forum**

The Open Consultation Process for the WSIS Forum 2021 is structured in five phases as follows:

- **Phase I: 9 September 2019** : Launch of the Open Consultations (Virtual Meeting open to all Stakeholders)
  1. Launch of the WSIS Forum 2021 Website for the Official Submissions
  2. Official submissions to the WSIS Secretariat on the Thematic Aspects and Innovations on the Format to be made via www.wsis.org/forum
  3. Open call for nominations for WSIS Forum 2021 Multi-stakeholder High-Level Track Facilitators
  4. Launch of the WSIS Photo Contest 2021
- **Phase II: 6 November 2020** : 1st Virtual Meeting: Open Forum on Implementation of WSIS Action Lines and WSIS Forum (during IGF 2020)
- **Phase III: 29 January 2021:** 2nd Physical/Virtual Meeting
- **Phase IV: 8 March 2021:** Deadline for Submissions of Official Contributions and Binding Requests for Workshops
- **Phase V: 19 April 2021:** Final Brief on the WSIS Forum 2021 (ITU Headquarters, Geneva)

458. 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.

459. **2) WSIS Prize 2021- Phases – www.wsis.org/prizes**

The contest is organized into five phases:

FIVE PHASES OF THE CONTEST

1. The first phase: Submission phase

   5 November 2020 – 25 January 2021 (Deadline for last submission: 23:00 Geneva time)

2. 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)

   1 February – 26 February 2021 (twenty projects per each category will be nominated)

3. The third phase: Public online voting (identification of five projects per category with the highest number of votes)

   1 March – 31 March 2021 (Deadline for casting last vote: 23:00 Geneva time)

4. The fourth phase: Selection of winning projects by the ITU Expert Group that will result with a list of winning projects

   1 April – 12 April 2021

5. The fifth phase: Announcement of winners to the public during WSIS Prize 2021 Ceremony at WSIS Forum 2021, and the release of publication "WSIS Stocktaking: Success Stories 2021", which is a compilation of extended descriptions of the 18 winning projects and 72 champion projects.

Phase one will open the call for submissions to the contest of the WSIS Prize 2021 at www.wsis.org/prizes. During the period from 1 November until 25 January 2021, all stakeholders are invited to submit WSIS related projects to the WSIS Prize 2020 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 2021, to be held from 17 to 21 May 2021 in Geneva, Switzerland. The winning projects will be showcased in the WSIS Stocktaking: Success Stories 2021 publication, while all submitted descriptions of projects and activities will be reflected in the WSIS Stocktaking Report 2021. We invite all WSIS Stakeholders to participate in the contest of WSIS Prizes 2021.

460. **WSIS** Stocktaking**: 2020-2021 Year-around Call for Update and New Entries is OPEN**

www.wsis.org/stocktaking

461. 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 350 000 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.

462. 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).

463. 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.

464. 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.

465. Submitted activities will be reflected in the WSIS Stocktaking Report 2021, which will be released at the WSIS Forum 2021 to be held from 17 to 21 May 2021 at ITU Headquarters, Geneva. We look forward to receiving your responses by 25 January 2021.

466. WSIS Forum 2021 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.

467. Following the success of the first three editions of the WSIS Forum Photo Contest, we are pleased to announce another successful edition of WSIS Photo Contest 2020 that was launched on 22 July 2019, inviting the community to picture how are ICTs advancing SDGs on the ground, therefore contributing to WSIS Stocktaking overall. More than 200 submissions were carefully reviewed and 3 winning photos, among 90 finalist, were selected and announced. Find all finalists and winners at the WSIS Photo Contest page https://www.itu.int/net4/wsis/forum/2020/PhotoContest. In addition, all photos that fit the criteria are being exposed at the dedicated WSIS Photo Contest 2020 Virtual Exhibition at the WSIS Forum 2020 online networking platform ImeetyouatWSIS https://wsisforum2020.pathable.co/ and will be also promoted in WSIS-related events.

468. 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 2021.

(VI) Final conclusions

469. The ITU is committed to connecting the world in its role as one of the lead facilitating organizations for the WSIS Process. In 2020, 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.

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.