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| Title: ITU logo | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2022-2024 | | | | TSAG-TD591R1 |
| TSAG |
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| **TD (Ref.:** [SG5-LS135](http://handle.itu.int/11.1002/ls/sp17-sg5-oLS-00135.docx)**)** | | | | | |
| **Source:** | | ITU-T Study Group 5 | | | |
| **Title:** | | LS/r on WTSA-24 preparations (reply to TSAG-LS34) [from ITU-T SG5] | | | |
| **LIAISON STATEMENT** | | | | | |
| **For action to:** | | | - | | |
| **For information to:** | | | TSAG | | |
| **Approval:** | | | ITU-T Study Group 5 management team (22 July 2024 by correspondence) | | |
| **Deadline:** | | | N/A | | |
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A new liaison statement has been received from SG5.

This liaison statement follows and the original file can be downloaded from the ITU ftp server at <http://handle.itu.int/11.1002/ls/sp17-sg5-oLS-00135.docx>.

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|  | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2022-2024 | | | | | **SG5-LS135** |
| **STUDY GROUP 5** |
| **Original: English** |
| **Question(s):** | | All/5 | | | | 22 July 2024 |
| **LIAISON STATEMENT** | | | | | | |
| **Source:** | | ITU-T Study Group 5 | | | | |
| **Title:** | | LS/r on WTSA-24 preparations (reply to TSAG-LS34) | | | | |
| **LIAISON STATEMENT** | | | | | | |
| **For action to:** | | | | – | | |
| **For information to:** | | | | TSAG | | |
| **Approval:** | | | | ITU-T Study Group 5 management team (22 July 2024 by correspondence) | | |
| **Deadline:** | | | | N/A | | |
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| **Abstract:** | This liaison informs TSAG that SG5, at its last meeting in this study period (Wroclaw, 17–21 June 2024), has completed the proposals for its set of Questions, as well as updates to its current title, mandate, lead roles and points of guidance (WTSA Res.2 elements), which will be included in its report to WTSA-24 as **required by WTSA‑20 Res.1**. The report of Study Group 5 to the WTSA-24 will be contained in the following WTSA-24 documents:  – Part I: **Document** [**5**](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T22-WTSA.24-C-0005) – General  – Part II: **Document** [**6**](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T22-WTSA.24-C-0006) – Questions proposed for study during the study period 2025–2028 |

Attachments:

1. Updates to the current SG5 title, mandate, lead roles and points of guidance (WTSA Res.2)
2. Updates to the current SG5 Questions

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[H DRAFT QUESTION H/5 Assessing the impact of telecommunications/ICTs on climate change, biodiversity and the environment - including the influence on other sectors 35](#_Toc171702643)

[I DRAFT QUESTION I/5 Climate change mitigation and smart energy solutions 39](#_Toc171702644)

[J DRAFT QUESTION J/5 Climate actions and adaptation to climate change through sustainable and resilient telecommunications/ICTs (including new and emerging) 42](#_Toc171702645)

ATTACHMENT 1  
SG5 report to WTSA-24: Updates to the current SG5 title, mandate, lead roles and points of guidance (WTSA Res.2)

The following are the proposed changes to the Study Group 5 mandate and Lead Study Group roles agreed at the last Study Group 5 meeting in this study period, based on the relevant portions of [WTSA-20 Resolution 2](https://www.itu.int/dms_pub/itu-t/opb/res/T-RES-T.2-2022-PDF-E.pdf). Revision marks are relative to WTSA Res.2 (Geneva, 2022).

Annex A  
(to WTSA Resolution 2)

#### PART 1 ‑ GENERAL AREAS OF STUDY

**…**

Study Group 5: Environment, climate action, circular economy and EMF​

ITU-T Study Group 5 is responsible for the development of standards on the environmental aspects of telecommunications/ICTs (including new and emerging) and protection of the environment, including electromagnetic phenomena and climate change.

Study Group 5 will study how these telecommunications/ICTs and digital transformation can be shaped to ensure they support transitions toward more sustainable societies.

Study Group 5 will also study issues related to resistibility, human exposure to electromagnetic fields (EMF), circular economy, energy efficiency and climate change adaptation and mitigation. It will develop international standards (ITU-T Recommendation), Supplements and Technical Reports that support the sustainable use and deployment of new and emerging telecommunications/ICTs. Additionally, it will evaluate the environmental performance, including impacts on environment, climate and biodiversity, of new and emerging telecommunications/ICTs.

Study Group 5 is also responsible for studying design methodologies and frameworks to reduce the volume and adverse environmental effects of e-waste and to support the transition towards a circular economy.

Study Group 5 will also develop international standards (ITU-T Recommendation), Supplements and Technical Reports to use the enablement effect of telecommunications/ICTs to reduce the climate impact of other sectors (e.g., energy, manufacturing industry, transportation and building). Additionally, it will study evaluation metrics and methods for a sustainable digital transition, focusing on industries with high GHG emissions.

Study Group 5 has an extended role in evaluating the impact of ICTs in accelerating climate-change adaptation and mitigation actions, particularly in industries (including the ICT sector), cities, rural areas and communities. To this end, it is also working to develop standards and guidelines for building resilient ICT infrastructures, as well as to develop assessment methodologies for the trajectories of the ICT sector in connection with the United Nations Sustainable Development Agenda 2030 and the Paris Agreement.

In addition to its climate-focused activities, Study Group 5 has five other important objectives:

1) To protect ICT (including telecommunication equipment and installations) against damage and malfunction due to electromagnetic phenomena, such as lightning, as well as from particle radiations.

2) To ensure the safety of personnel and users of networks in relation to electrical hazards existing in telecommunication/ICT networks.

3) To improve confidence in the use of radio frequencies by developing standards to assess EMF levels and to verify compliance with the World Health Organization (WHO) recommended human exposure guidelines and limits.

4) To enhance the reliability and safety of telecommunication/ICT networks, by providing requirements on resistibility and electromagnetic compatibility (EMC) and addressing the effect of particle radiation.

5) To ensure that the functionality of telecommunication/ICT equipment is not compromised by electromagnetic interference related to radiated and conducted disturbances emitted by other electrical or communications systems.

Study Group 5 is responsible for studies on how to use new and emerging telecommunications/ICTs to tackle environmental challenges in line with the Sustainable Development Goals (SDGs).

**…**

#### PART 2 ‑ Lead Study Groups in specific areas of study

**…**

SG 5 Lead study group on electromagnetic compatibility (EMC), resistibility and lightning protection

Lead study group on soft error caused by particle radiations

Lead study group on human exposure to electromagnetic fields (EMF)

Lead study group on circular economy and e-waste management

Lead study group on ICTs related to the environment, energy efficiency, clean energy and sustainable digitalization for climate actions

**…**

Annex B  
(to WTSA Resolution 2)  
  
Points of guidance to study groups for the development  
of the post-2022 work programme

**…**

ITU-T Study Group 5 will develop Recommendations, supplements and other publications to:

• study the environmental performance of new and emerging telecommunications/ICTs and their effects on climate change, biodiversity and other environmental impacts;

• accelerate climate-change adaptation and mitigation actions through the use of ICTs/telecommunications (including new and emerging technologies);

• study the environmental aspects of new and emerging telecommunications/ICTs, including issues related to electromagnetic fields (EMF), electromagnetic compatibility (EMC), energy feeding and efficiency, and resistibility;

• play an active role in reducing the volume of e-waste and facilitate its management, in order to enhance the transition to a circular economy;

• study lifecycle and rare-metal recycling approaches for ICT equipment to minimize the environmental and health impact of e-waste;

• achieve energy efficiency and sustainable clean energy use in new and emerging telecommunications/ICTs, including, but not limited to, labelling, procurement practices, standardized power supplies/connectors, eco-rating schemes;

• build resilient and sustainable ICT infrastructures in urban and rural areas, as well as in cities and communities;

• study the role of ICTs and new and emerging telecommunications/ICTs in climate-change adaptation and mitigation;

• reduce the volume of e-waste and its environmental impacts (including the environmental impact of counterfeit devices);

• study the transition to a circular economy and implementing circular actions in cities;

• study the role of new and emerging telecommunications/ICTs to achieve Net Zero within the ICT sector and other sectors, as well as in cities;

• develop methodologies for assessing the environmental impact of new and emerging telecommunications/ICTs;

• develop standards and guidelines for using new and emerging telecommunications/ICTs in an eco-friendly way and enhancing rare-metal recycling and energy efficiency of ICT, including infrastructures/facilities

• develop standards, guidelines and metrics/key performance indicators (KPIs) for aligning the environmental performance of the ICT sector and new and emerging telecommunications/ICTs with the United Nations Sustainable Development Agenda 2030, the Paris Agreement and the Connect 2030 Agenda;

• develop energy efficiency/performance metrics/KPIs and related measurement methodologies for new and emerging telecommunications/ICTs, including infrastructures and facilities;

• develop tools and guidance on proper, effective and simple communication to reach out to the general public on environmental issues, including EMF, EMC, resistibility, climate-change adaptation and mitigation, etc.;

• study methodologies for assessing the environmental impact of ICT, in terms of both its own emissions and power usage and the savings created through ICT applications in other industry sectors;

• study power-feeding methodologies that effectively reduce power consumption and resource usage, increase safety and increase global standardization for economic gains;

• set up a low-cost sustainable ICT infrastructure to connect the unconnected;

• study how to use ICTs to help countries and the ICT sector to adapt and build resilience to the effects of environmental challenges, including climate change;

• assess the sustainability impact of ICT to promote the Sustainable Development Goals (SDGs);

• study the protection of ICT networks and equipment from interference, lightning and power faults;

• develop standards related to the assessment of human exposure to EMF produced by ICT installations and devices;

• develop standards related to safety and implementation aspects related to ICT powering and to powering through networks and sites;

• develop standards related to components and application references for protection of ICT equipment and the telecommunication network;

• develop standards related to EMC, particle radiation effects, and assessment of human exposure to EMF produced by ICT installations and devices, including cellular phones, IoT devices and radio base stations;

• develop standards on the reutilization of the existing copper network outside plant and related indoor installations; and

• develop standards to guarantee good reliability and low latency for high-speed network services by providing requirements on resistibility and EMC.

The meetings of Study Group 5 and its working parties/Questions should, as far as practicable, be collocated with other study groups/working parties/Questions involved in the study of environment, circular economy, energy efficiency and climate change to address the SDGs.

**…**

Annex C  
(to WTSA Resolution 2)  
  
List of Recommendations under the responsibility of the respective   
study groups and TSAG in the 2025–2028 study period

*No changes are proposed to the list of Recs under SG5 responsibility in Res.2 Annex C.*

* ITU-T K-series
* ITU-T L.1 - ITU-T L.9, ITU-T L.18 - ITU-T L.24, ITU-T L.32, ITU-T L.33, ITU-T L.71, ITU-T L.75, ITU-T L.76, ITU-T L.1000-series

ATTACHMENT 2  
SG5 report to WTSA-24: Updated Questions for the 2025–2028 study period

## List of Questions proposed by Study Group 5

| Question number | Question title | Status |
| --- | --- | --- |
| QA/5 | Electrical protection, reliability, safety, and security of telecommunications/ICT systems | Continuation of part of Q1/5 & part of Q2/5 |
| QB/5 | Equipment specification and component/device for protection against lightning and other phenomena | Continuation of part of Q1/5 and part of Q2/5 |
| QC/5 | Assessment of human exposure to electromagnetic fields (EMFs) | Continuation of Q3/5 |
| QD/5 | Electromagnetic compatibility (EMC) aspects in telecommunications/ICTs | Continuation of Q4/5 |
| QE/5 | Environmental efficiency of telecommunications/ICTs | Continuation of Q6/5, part of Q11/5 and part of Q12/5 |
| QF/5 | E-waste, circular economy, and sustainable supply chain management | Continuation of Q7/5 and part of Q13/5 |
| QG/5 | Guidance and terminology on environment | Continuation of Q8/5 |
| QH/5 | Assessing the impact of telecommunications/ICTs on climate change, biodiversity and the environment - including the influence on other sectors | Continuation of Q9/5 |
| QI/5 | Climate change mitigation and smart energy solutions | Continuation of part of Q11/5 |
| QJ/5 | Climate actions and adaptation to climate change through sustainable and resilient telecommunications/ICTs (including new and emerging) | Continuation of part of Q12/5 and Q13/5 |

## Wording of Questions

### A DRAFT QUESTION A/5 Electrical protection, reliability, safety, and security of telecommunications/ICT systems

(Continuation of part of Question 1/5 & part of Question 2/5)

#### A.1 Motivation

The widespread use of information and communication technologies (ICTs) is dramatically changing society, keeping people and things connected to information network, regardless of their location. Dependency among social infrastructures such as the communication and information networks, power, water/sewerage and transportation systems increase much more in future society. In particular, the communication and information networks will act as a “nerve system”, and the importance of its reliability and security continues to grow. The reliable ICT networks are essential for controlling power grid systems, water supply systems and other infrastructures to get maximum efficiency, and minimize loss or waste for circular economy and smart cities. Therefore, deficiency of some infrastructure function will cause serious social disruption especially in smart cities.

The infrastructure is composed of telecommunication network equipment, which is susceptible to damage or interference produced by external physical phenomena, such as nearby lightning strikes, disturbances in the neighbouring electric power system and electromagnetic attack. Therefore, if not properly protected, a highly sophisticated telecommunication system can be placed into an out-of- service condition by such phenomena.

There are two kinds of methodology to provide cost effective protective measures in order to improve the telecommunication network's reliability from these events. The first one is protection measures applied to facilities and systems including earthing and bonding, magnetic shielding and cabling, coordination of SPD system, etc. The other one is specifications and test methods applied to ICT equipment and corresponding protection components and devices. This Question studies measures applicable to facilities and systems, against the effects by lightning, attacks using extreme electromagnetic field such as High-Altitude Electromagnetic Pulse (HEMP) and High- Power Electromagnetic (HPEM), causing threats for ICT societies.

This Question is related directly and indirectly to climate change. The direct relationship is the reduction of e-waste, represented by the significant reduction of equipment replacement due to electric damage, and the need of improved protection levels as storm intensities increase. The indirect relationship is associated to the improved reliability and sustainability of the telecommunication system, which reduces fuel consumption, as people do not need to travel for face-to-face meetings as much when real-time video services are available.

The following Recommendations, Directives, Handbooks and Supplement, in force at the time of approval of this Question, fall under its responsibility:

– ITU-T K.6, K.7, K.8, K.9, K.13, K.14, K.19, K.26, K.27, K.29, K.35, K.39, K.40, K.46, K.47, K.54, K.56, K.57, K.66, K.67, K.68, K.71, K.72, K.73, K.78, K.81, K.84, K.87, K.89, K.97, K.101, K.104, K.105, K.107, K.108, K.109, K.110, K.111, K.112, K.115, K.119, K.120, K.125, K.134, K.142, K.146, K.154, K.155, L.75;

– Directives (except Volume VIII);

– Handbook on Earthing and Bonding;

– Handbook on Lightning;

– K-series Supplements 5, 6.

#### A.2 Questions

The purpose of this Question is to produce new or revised Recommendations or Supplements regarding the protection of telecommunication systems applicable to facilities and systems against the effects of nearby lightning strikes, disturbances from nearby electric power systems, and human-made extreme electromagnetic fields.

Study items to be considered include, but are not limited to:

– Lightning protection of wireless access systems, in particular radio base stations having equipment (e.g., remote radio head) installed in high structures exposed to lightning strikes, as well as miniature remote distributed base stations intended to provide wireless access in densely populated areas;

– Lightning protection of fixed telecommunications lines;

– Consideration of customer safety from the results of nearby lightning strikes and potential power fault events whereby telecommunication ports become influenced by the electric field of the electric power grid;

– Lightning protection of home network cabling, including the unshielded twisted pair (UTP) and shielded twisted pair (STP) used for access to Internet services;

– Lightning protection of telecommunication stations (central office and access nodes), in particular those that make up part of the network's backbone, which requires a higher reliability;

– Lightning protection of specific telecommunication systems installed in exposed environments;

– Utilization of the data from lightning location systems (LLS) to optimize the network protection;

– Protection of users of telecommunications services from the dangerous effects of lightning strikes;

– Bonding configurations and earthing of telecommunication installations, including earthing of power feeding systems for protection against lightning strike and extreme electromagnetic phenomena;

– Requirements for earthing and equipotential bonding under transient conditions, as those caused by lightning strike and extreme electromagnetic phenomena;

– Protection of telecommunication installations where desired earthing conditions cannot be achieved;

– Damages and hazards caused by electric power and electric traction systems to telecommunication systems;

– Damages and hazards to telecommunication systems by the emergence of harmonics flowing on power systems, as a result of the dissemination of distributed power generation, such as inverters of the photovoltaic (PV) systems;

– Protection against the effects of short-circuits in the nearby electric power lines due to the possible malfunction of newly adopted self-healing systems by the power utilities;

– Requirements for the deployment of telecommunication systems on structures used by the power utilities, also considering its use for smart grid applications;

– Technical requirement for preventing information leaks by unexpected radio emission from equipment (EMSEC: Electromagnetic emanation security);

– Protection of telecommunication and data centres from attacks using high power radio waves (high-altitude electromagnetic pulse (HEMP) and high power electromagnetic (HPEM);

– Methods for mitigation of malfunction and damages caused by high electromagnetic field by applying measures including electromagnetic shielding;

Note: The issues on protective devices for overvoltage and overcurrent are studied in context of “facilities and systems”, i.e., consideration as a part of surge protection system taking into account overvoltage and overcurrent characteristics at each protection environment on power/signal lines, in this Question. The issues regarding protective devices in context of specifications, i.e., consideration of its circuit configuration, test methods, performance criteria related to protection of equipment, are under the responsibility of Question B/5 – “Equipment specification and component/device for protection against lightning and other phenomena”.

#### A.3 Tasks

Tasks include, but are not limited to:

– Recommendations and Supplements on the assessment of the conformance of radio base station regarding lightning protection and earthing;

– Recommendations and Supplements on the lightning protection and earthing of miniature wireless base station;

– Recommendations and Supplements on the use of data of lightning positioning system for network protection;

– Recommendations and Supplements on the protection of small-size telecommunication installation with poor earthing condition;

– Recommendations and Supplements on the lightning protection and earthing of video surveillance system;

– Recommendations and Supplements on the dangerous effects and protective measures against electromagnetic disturbances when Internet data centre is co-sited with high-voltage substation;

– Recommendations and Supplements on the damages and hazards on telecommunication transmissions on copper lines to cover railway interference on ADSL/ADSL2/VDSL2/G.fast and other new broadband delivery services;

– Guides on the use of lightning protection, earthing, and bonding Recommendations;

– Maintenance and enhancement of existing Recommendations on security concerning electromagnetic phenomena (HEMP, HPEM, information leakage);

– Recommendations for the test method and procedures against HEMP, HPEM and information leakage;

– Revision and maintenance of the existing publications (Recommendations, Handbooks, and Directives) under the Question responsibility, as required.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=1/5>).

#### A.4 Relationships

WSIS Action Lines:

– C2, C5

Sustainable Development Goals:

– 7, 9

Recommendations:

– K-series

Questions:

– QB/5, QD/5

Study Groups:

– ITU-T SGs

– ITU-R SGs

– ITU-D SGs

Other bodies

– IEC (e.g. TC37A, IEC TC77/SC77C, IEC TC81,and IEC JTC1)

– IEEE (e.g. EMC TC5)

– CENELEC (e.g. TC81X)

– ETSI (e.g. TC EE)

– CIGRE (e.g. JWG C4.31, and C4.206 WG)

– UIC

### B DRAFT QUESTION B/5 Equipment specification and component/device for protection against lightning and other phenomena

(Continuation of part of Question 1/5 and part of Question 2/5)

#### B.1 Motivation

Information and Communication Technology (ICT) equipment and devices are being increasingly networked to satisfy the needs of such things as smart cities and Internet of Things (IoT). Where items are connected with metallic conductors, overvoltage and overcurrent surges resulting from coupled lightning and other electrical stress events may occur. Also, items including semiconductor components are often influenced by particle radiation such as neutrons. If the network items do not have sufficient withstand resistibly to the coupled surge conditions or particle radiations, these events may cause interruption of information transfer, equipment damage or hazardous conditions. ICT equipment should be designed to recover after transmission interruptions, damaged items may impair equipment performance and failed items need repair or replacement, which interrupts operation and creates e-waste.

There are two kinds of methodology to provide cost-effective protective measures in order to improve the telecommunication network's reliability from these events. The first one is protection measures applied to facilities and systems, including earthing and bonding, magnetic shielding and cabling, coordination of SPD system. The other one is specifications and test methods applied to ICT equipment and corresponding protection components and devices. This Question studies measures applicable to equipment and devices/components against the effects by overvoltage and overcurrent including lightning surges, and by particle radiations.

This Question is related directly and indirectly to climate change. The direct relationship is the reduction of e-waste, represented by the significant reduction of equipment replacement due to electric damages, and the need of improved protection levels as storm intensities increase. The indirect relationship is associated to the improved reliability and sustainability of the telecommunication system, which reduces fuel consumption, as people do not need to travel for face-to-face meetings as much when real-time video services are available.

The following deliverables (Recommendations, Supplements, Handbooks and Directives), in force at the time of approval of this Question, fall under its responsibility:

– ITU-T Recommendation K-series: Protection against interference, K.11, K.12, K.20, K.21, K.28, K.36, K.44, K.45, K.50, K.51, K.55, K.64, K.65, K.69, K.75, K.77, K.82, K.89, K.95, K.96, K.98, K.99, K.102, K.103, K.117, K.118, K.124, K.126, K.128, K.129, K.130, K.131, K.135, K.138, K.139, K.140, K.143, K.144, K.147, K.148;

– K-series Supplements 3; 7, 8, 11, 12, 15, 17, 18, 21, 22, 23, 24, 25, 27, 28, 30, 31;

– Implementers K.Imp Guides for K.44 and for K.20 + K.21 + K.45 combination;

– Directives, Volume VIII.

#### B.2 Questions

The purpose of this Question is to produce new or revised Recommendations or Supplements regarding requirements and test methods to achieve resistibility against overvoltages and overcurrents, and also reliability against particle radiations for ICT equipment. Specifications and test methods applicable to protective components and assemblies are also recommended. The resistibility and reliability Recommendations against overvoltages and overcurrents, and particle radiations apply to equipment installed in telecommunications centres, in the access and trunk networks and at customer premises. The protective components and assemblies are related to both telecommunication and power supply circuits of telecommunication equipment and they are intended to mitigate the effects of overvoltages and overcurrents. The sources of overvoltages and overcurrents considered are those that may cause permanent damage and include lightning, electrostatic discharge (ESD), electrical fast transients (EFTs), power induction, and mains power contacts.

Study items to be considered include, but are not limited to:

– New requirements on Ethernet port resistibility testing due to the use of longer cabling connected to this port, often running in outdoor environments (called “BASE-T1 Ethernet” or “single-pair Ethernet”);

– Effect of multiple surges (e.g., generated by subsequent lightning strokes) on equipment resistibility and on the performance of surge protective components and devices;

– Effect of fast rising overvoltages (e.g., induced by a nearby lightning flash) on the equipment resistibility;

– Determine equipment resistibility taking into account the effects of new equipment port types connecting to new and different services;

– The protection of mains ports considering the coordination between the primary protector and equipment inherent protection;

– The protection of non-earthed equipment with surge protective components (SPCs) that bridge the safety isolation, which are effective but currently not allowed by IEC safety standards (e.g., IEC 60950-1/IEC 62368-1);

– Review USB 3.0 implementations for correct equipment resistibility levels and recommendations;

– Review Ethernet isolation requirements, including new Power over Ethernet (PoE) non-IEEE 802.3 compliant versions;

– Update the safety Recommendations taking into account the evolution of IEC safety standards (e.g., IEC 60950-1 and IEC 62368-1);

– Effects of induced voltages by electric power and railway lines in normal conditions on safety voltage limits on telecommunication lines;

– Review the test method for coaxial port taking into account IEC 61000-4-5;

– Review the safety aspects of DC Remote Power Feeding System considering the relevant IEC standards;

– Review of protective components requirements in order to include safety requirements (e.g., thermal disconnect switch for metal oxide varistor and fail-safe device for gas discharge tubes);

– Coordination of overcurrent protection components with the system current capability;

– Requirements of surge protective components and devices in order to be compatible with broadband data communications;

– Coordination between surge protective components installed in the same circuit;

– Use of insulation barriers as a means of blocking longitudinal/common-mode voltage surges;

– Transients generated by the operation of switching-type overvoltage protectors;

– Define surge resistibility requirements for broadband fast access to subscriber terminals (G.fast) ports.

– Total design methodologies of ICT equipment/systems for applying soft error countermeasures;

– Requirements for soft error test facilities consisting of particle accelerators to produce neutron irradiation and test procedures for ICT equipment;

– Quality estimation method to find reliability in the real installation based on neutron irradiation test;

– Countermeasures based on the phenomena found in the neutron irradiation test.

Note: The issues regarding protective devices for overvoltage and overcurrent are studied in context of specifications, i.e., consideration on its circuit configuration, test methods, performance criteria related to protection of equipment, in this Question. The issues regarding protective devices in contest of “facilities and systems”, i.e., consideration as a part of surge protection system taking into account of overvoltage and overcurrent characteristics at each protection environment on power/signal lines, are under the responsibility of Question A/5 – “Electrical protection, reliability, safety, and security of telecommunications/ICT systems”.

#### B.3 Tasks

Tasks include, but are not limited to:

– Monitor and comprehend the evolution of ICT systems, their safety requirements, and their electrical environments;

– Revise or create K-series Recommendations, supplements, and implementers' guides to provide up to date performance requirements, safety requirements evaluation procedures and application advice for ICT equipment, ICT devices and surge protective component needs;

– When necessary, respond to or create liaisons with other bodies concerning the task force scope topics.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=2/5>).

#### B.4 Relationships

WSIS Action Lines:

– C2, C5

Sustainable Development Goals:

– 7, 9

Recommendations:

– ITU-T Recommendation K-series

Questions:

– QA/5, QD/5

Study Groups:

– ITU-T SGs

– ITU-R SGs

– ITU-D SGs

Other bodies:

– IEC (e.g. TC37, SC37A, SC 37B, TC47, TC 64, SC77B, TC81, TC107, TC 108 and TC 109,)

– ISO

– CENELEC

– IEEE-PES-SPDC

– ATIS (STEP)

– UL

– ETSI

– JEDEC

### C DRAFT QUESTION C/5 Assessment of human exposure to electromagnetic fields (EMFs)

(Continuation of Question 3/5)

#### C.1 Motivation

Information and communication technologies (ICTs) including telecommunications systems, radiocommunication systems, radio terminals and other electrical equipment and systems contribute to electromagnetic fields in the environment.

Telecommunications operators, manufacturers and governments, as well as other compliance entities have to assess (i.e., measure or calculate) and verify if the levels of electromagnetic fields emitted to the environment by telecommunications/ICTs comply with human exposure guidelines and limits recommended by the World Health Organization (WHO).

Providing accurate information on RF-EMF exposure levels can help with transparency and improving confidence in the use and implementation of RF technologies. The ITU-T Recommendations and Supplements provide guidance on assessing and monitoring of electromagnetic fields (EMF) in selected areas of public interest. The aim is to demonstrate that electromagnetic fields comply with applicable exposure limits, thereby providing the general public with clear and easily accessible data on electromagnetic field levels. This Question will develop standards (ITU-T Recommendations), informative documents (ITU-T Supplements) for the protection of people exposed to EMF emitted by telecommunications/ICTs taking into consideration the existing EMF international standards and Recommendations dedicated to electrical, electronic, and related technologies.

These Recommendations and guidelines should provide appropriate support to countries in establishing national regulations concerning assessment, evaluation, compliance and monitoring of RF EMF.

Additionally, taking into consideration the need to assess the levels of EMFs to which employees may be exposed to EMF, this Question will also develop standards, supplements, guidelines, technical papers, and methodologies for compliance with exposure limits of workers to electromagnetic fields, including power supplies.

The following Recommendations and Supplements, in force at the time of approval of this Question, fall under its responsibility:

– ITU-T K.52, K.61, K.70, K.83, K.90, K.91, K.100, K.113, K.121, K.122, K.145, K153; K.156

– K-series Supplements 1, 4, 9, 13, 14, 16, 19, 20, 29 and 32

#### C.2 Questions

The purpose of this Question is to develop international standards (ITU-T Recommendations) and guidelines (ITU-T Supplements) concerning construction and maintenance, use of radiocommunication installations and proper use of devices and information on factors affecting exposure from devices in order to assure compliance with RF EMF exposure limits. These Recommendations and guidelines should provide appropriate support to countries in establishing national regulations concerning assessment and compliance of RF EMF exposure.

The Question will also develop standards, technical papers, and methodologies for compliance with exposure limits of general public and workers to electromagnetic fields.

To achieve this goal, this Question will address measurement and numerical modelling techniques and procedures for evaluating the electromagnetic fields due to new and emerging telecommunications/ICTs including, but not limited to, telecommunication systems and radio terminals.

Study items to be considered include, but are not limited to:

– Site measurements in the real environment of the multiple sources operating on different frequencies and different transmitting antennas;

– Use and modelling of different transmitting antennas: broadband antennas, multiband antennas, antenna systems, smart (beam-forming) antennas, MIMO and massive MIMO antennas, etc.;

– Approximation associated with various algorithms for determining the validity of electromagnetic field predictions;

– Procedures and guidance on measurements and numerical modelling of the electromagnetic fields in the areas around telecommunication transmitting antennas: accuracy, uncertainty, reflections, influence of the human body, etc.;

– Guidance based on existing specific absorption rate (SAR), and power density (absorbed, incident and plane wave equivalent), measurement and calculation procedures, techniques and protocols for evaluating the electromagnetic field due to radiocommunication equipment;

– Work concerning guidance on the selection of spatial and time averaging method based on the results of measurements;

– Guidance on Human exposure to RF EMF in which the answers for the frequently asked questions will be provided;

– Guidance on proper, effective and simple communication of EMF to the general public;

– Guidance on the EMF exposure of the workers in the vicinity of telecommunication installations and facilities;

– Guidance concerning assessment, compliance, evaluation and monitoring of human exposure levels when a wireless installation is put into operation;

– EMF exposure assessment and compliance of new and emerging telecommunications/ICTs, for example IoT and IMT 2020 (5G), and future evolutions such as IMT 2030 (6G) systems;

– Consideration of the exposure from non-radiocommunication EMF sources in case these may be considered as ambient sources and should be included in the total exposure assessment.

#### C.3 Tasks

Tasks include, but are not limited to:

– Recommendations for management of human exposure to RF EMFs emitted to the environment by new and emerging telecommunications/ICTs taking into consideration existing international standards;

– Recommendations related to the measurement and assessment concerns related to human exposure to electromagnetic fields in order to assist developing countries;

– Recommendations and Supplements on effective and simple communication of EMF to the general public;

– Review the outcome and recommendations from the World Health Organization (WHO) on guideline to limit human exposure to electromagnetic fields;

– Assess the impact and potential changes required to the ITU-T Recommendations on RF EMF;

– Recommendations and guidelines for telecommunications operators, manufacturers and, governments, as well as to other compliance entities on the assessment (i.e. measure or calculate) and verification of the levels of electromagnetic fields emitted to the environment in compliance with the World Health Organization (WHO) recommended human exposure guidelines and limits;

– Recommendations and guidelines for RF EMF exposure assessment from new and emerging ICTs including IoT, IMT 2020 (5G) and future evolutions such as IMT 2030 (6G) systems as well as results of measurement, evaluation, monitoring and calculations and overview of the impact on EMF levels;

– Recommendations and guidelines for the assessment of the exposure levels from radiocommunication base stations and antennas;

– Informative documents with EMF exposure from non-radiocommunication sources simultaneously operating close to radiocommunication installations;

– Maintenance and enhancement of the existing Recommendations including ITU-T K.52, K.61, K.70, K.83, K.90, K.91, K.100, K.113, K.121, K.122, K.145, K.153 and K.156;

– Maintenance and enhancement of the existing ITU-T K-series Supplements 1, 4, 9, 13, 14, 16, 20, 29 and 32.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=3/5>).

#### C.4 Relationships

**WSIS Action Lines:**

– C2, C5

**Sustainable Development Goals:**

– 7, 9

**Recommendations:**

– ITU-T K-series

**Questions:**

– QD/5

**Study Groups:**

– ITU-T SGs

– ITU-R SGs, in particular taking into account the ITU-R studies on EMF measurements to assess human exposure in response to ITU-R SG1 Question ITU-R 239/1

– ITU-D SG2 mainly Q7/2 on EMF policies

**Other bodies:**

– WHO

– IEC TC 106

– ICNIRP

– IEEE ICES

– CENELEC TC 106X

### D DRAFT QUESTION D/5 Electromagnetic compatibility (EMC) aspects in telecommunications/ICTs

(Continuation of Question 4/5)

#### D.1 Motivation

The electromagnetic environment is changing rapidly because of the increase in the deployment of new types of electric/electronic devices/equipment, the increase of radio devices, and the evolving of the telecommunications/ICTs infrastructure. Examples impacting electromagnetic environment are the deployment of products/devices with higher clock frequencies, the deployment of new radio systems, the increase in the use of wireless power transmission (WPT) systems with high-power radio frequency current, the deployment of new broadband telecommunication services, and the increase of inter-connected devices. Furthermore, the control of the electromagnetic environment is necessary for the development and deployment of innovative products and protection of telecommunications/ICTs networks to address sustainability goals.

On the other hand, the philosophy of EMC standards is to specify the protection of radio services used in close environments but currently it also needs to address the deployment of a high density of radio devices in the same environment, and this will increase the mutual interference and intermodulation cases.

Aspects impacting the electromagnetic environment in telecommunications/ICTs applications are:

– The large deployment of photovoltaic systems and wind turbines for the utilization of natural energies requires the control of the electromagnetic disturbances that may be generated by high-power inverters or switching power units. Similar disturbances can also be generated by switching power converters in electric systems such as air conditioners, ICT equipment, LED lightings, charger for Electric Vehicles (EV) or Plug-in Hybrid EV (PHEV), and so on;

– The popular use of a variety of both wireless and wireline technologies for the exchange of voice and data over short-range connection and telecommunications/ICT networks, for example:

• The deployment of public Wi-Fi access points in cities, suburbs, and communities;

• The use of wireless Access technologies (UWB, NFC, LTE, IMT2020, IMT2030 etc.);

• The use of various type of wireless or wireline equipment such as mobile phones, tablets, mobile data, and wideband data access terminal equipment, changes the Electromagnetic (EM) environment.

– Increase of interconnection of devices for smart cities and intelligent transports;

– Deployment of control and billing devices in smart grids.

Furthermore, wearable devices and wireless systems can be used in the vicinity of telecommunications/ICTs equipment in telecommunication and data centres, and the wearable devices are required to operate correctly in the high-level electromagnetic field.

The situation that ICT equipment is used in the vicinity of radio communications systems will be far more common with the growth of distributed ICT devices. Low transmission rate wireless systems that use distributed ICT devices for transmitting data from various kinds of sensors may become candidates of victim devices by disturbance from telecommunication/ICT networks.

Hence, it is necessary to study methodologies for predicting and mitigating EMC problems that might impact the operation of these technologies.

The EMC requirements for general telecommunications/ICTs equipment are studied and published by IEC CISPR and TC77. However, the requirements cannot be directly applied to all telecommunications/ICTs equipment as the convergence of information technology (IT) and communication equipment because they do not always consider influences on wired/wireless communications and characteristics of sensitive equipment in telecommunication and data centres. Therefore, studies on the EMC requirements for telecommunications/ICTs equipment are essential in ITU-T for keeping quality and reliability of telecommunications/ICTs systems and services.

This Question aims to establish thorough EMC requirements including emission and immunity requirements for telecommunications/ICTs equipment, and countermeasures for facilities to reduce electromagnetic compatibility issues and maintain a controlled electromagnetic environment for telecommunications/ICTs systems and services.

It is also important to define requirements for electric and electronic apparatuses used in telecommunications/ICTs facilities to maintain a suitable electromagnetic environment for telecommunications/ICTs systems.

The following Recommendations and handbooks, in force at the time of approval of this Question, fall under its responsibility:

– ITU-T K.10, K.18, K.23, K.24, K.34, K.37, K.38, K.42, K.49, K.58, K.59, K.60, K.62, K.63, K.74, K.76, K.79, K.80, K.86, K.92, K.93, K.94, K.106, K.114, K.116, K.127, K.132, K.133, K.136, K.137, K.149, K.152; K.157

– K-series Supplements 10 and 26;

– Handbook on interference measuring techniques, and handbook on mitigation measures for telecommunication installations.

#### D.2 Questions

The purpose of this Question is to produce new or revised Recommendations or Supplements regarding EMC (emission and immunity) requirements for telecommunications/ICTs installations and equipment - including the wireless and wireline equipment, and electric and electronic equipment installed in telecommunications/ICTs facilities.

Measures to prevent interferences between broadband signals in telecommunication and power lines, and radio signals will be studied. Guidance on procedure to solve the problem and mitigation measures will be also recommended.

#### D.3 Tasks

Tasks include, but are not limited to:

– Methodology for evaluating the disturbance with radio services from telecommunications/ICTs systems using metallic conductors;

– Estimation of interferences from wireless power transmission (WPT) systems to telecommunications/ICTs systems;

– Definition of EMC requirements for WPT systems;

– Estimation of interferences from grid connected power converter (GCPC) used in, for example, photovoltaic systems;

– Development of EMC requirements for GCPC systems;

– Estimation of interferences from electric charger for EV, or PHEV to telecommunications/ICTs systems in surroundings;

– Evaluation of interferences from telecommunications/ICTs systems to low-rate wireless systems for distributed ICT devices;

– Evaluation and prediction methodology of performance degradation due to electromagnetic interference between wireless and wireline services;

– Evaluation and mitigation methodology of electromagnetic disturbance and performance criteria between different modules in converged telecommunications/ICTs equipment;

– Definition of emission requirements for electric and electronic equipment, other than ICT equipment, used in telecommunications/ICTs facilities;

– Specifications for preventing mutual-intermodulation (including Passive Intermodulation specifications) in the environment with high density antenna installations;

– EMC specifications taking into account IMT2020 (i.e. 5G) and IMT2030 systems;

– Evaluation and prediction methodologies of performance degradation due to electromagnetic disturbances in deploying telecommunications/ICTs equipment in vertical applications, such as power sub-stations, charging stations and railways environment;

– Definition of emission requirements for IoT devices using different interconnecting technologies (e.g., power line communication);

– Maintenance and enhancement of existing Recommendations and Supplements on electromagnetic environment and requirements for EMC. This activity is needed to keep up-to-date the EMC Recommendations in line with the latest: basic test methods, CISPR limits, new technologies, etc.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=4/5>).

#### D.4 Relationships

WSIS Action Lines:

– C2, C5

Sustainable Development Goals

– 7, 9

Recommendations:

– G.117, L.75, L.19 and other K-series

Questions:

– QA/5, QB/5, QC/5

Study Groups:

– ITU-T SGs

– ITU-R SGs, in particular taking into account the ITU-R studies on the impact of WPT for electric vehicles on radiocommunication services

– ITU-D SGs

Other bodies:

– IEC CISPR

– IEC TC 77, IEC TC 69

– ETSI ERM EMC WG

– CENELEC TC210, TC215 WG2

– IEEE EMC society

– 3GPP RAN4

### E DRAFT QUESTION E/5 Environmental efficiency of telecommunications/ICTs

(Continuation of Question 6/5, part of Question 11/5 and part of Question 12/5)

#### E.1 Motivation

The emergence of the metaverse,[[1]](#footnote-1) along with cutting-edge technologies such as artificial intelligence, blockchain, 5G/IMT2020 and beyond, the Internet of Things (IoT), autonomous vehicles, robotics, VR/AR, and digital twins, represents a profound shift brought by the Fourth Industrial Revolution.

The environmental impact of current as well as new and emerging telecommunications/ICTs is frequently underestimated, even though it is crucial to maintain and expand the network infrastructure to ensure universal connectivity. These telecommunications/ICTs rely on ICT equipment, data centres, and telecom installations to facilitate seamless communication. Access equipment, routers, servers, storage systems, switches, and transport equipment play pivotal roles in enabling high-speed, large-scale broadband services and computational activities. To support the next generation of wireless networks and various IoT applications, additional radio base stations and data centres, including edge data centres, are indispensable. Unfortunately, the energy consumption of these equipment and installations is substantial, making a significant contribution to global carbon emissions. As we step into the era of augmented reality (AR) and the metaverse, it becomes imperative to address the environmental impact and develop sustainable solutions to mitigate the carbon footprint associated with the expansion of this digital infrastructure.

This Question explores the environmental efficiency needs of telecommunication and ICTs, covering aspects like water (used in cooling and humidification) and energy efficiency. It also examines how emerging technologies like AI, digital twins, and the metaverse are key to improving environmental efficiency in the ICT sector, reducing operational costs through better management tools. The focus is on developing technical solutions, metrics, key performance indicators, and accurate measurement methods for different telecom/ICT types. In addition, the lack of adequate broadband infrastructure is also limiting the adoption of telecommunications/ICTs in rural areas. Low-cost, portable and energy efficient powering units and broadband infrastructures can accelerate the adoption of ICTs in these areas.

This Question is also in line with the following Sustainable Development Goals: SDG 7 “Ensure access to affordable, reliable, sustainable and modern energy for all”; SDG 9 "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation"; SDG 11 “Make cities and human settlement inclusive, safe, resilient and sustainable”; and SDG 13 "Take urgent action to combat climate change and its impact".

The following Recommendations and Supplements, in force at the time of approval of this Question, fall under its responsibility:

– ITU-T L.1200, L.1201, L.1202, L.1203, L.1204, L.1205, L.1206, L.1207, L.1210, L.1230, L.1240, L.1241, L.1260, L.1300, L.1301, L.1302, L.1303, L.1305, L.1306, L.1307, L.1327, L.1360, L.1361, L.1362, L.1380, L.1381, L.1382, L.1310, L.1315, L.1316, L.1317, L.1318, L.1320, L.1321 L.1325, L.1326, L.1330, L.1331, L.1332, L.1333, L.1340, L.1350, L.1351, L.1390, L.1700;

– L-series Supplements 1, 6, 7, 8, 9, 10, 11, 12, 22, 23, 29, 30, 31, 33, 36, 41, 42, 43, 44, 45, 48, 53 and 59;

#### E.2 Questions

Study items to be considered include, but are not limited to:

– What study areas and Recommendations are needed to address energy and water consumption used in cooling solution of telecommunications/ICTs and infrastructure, including data centres, to improve environmental efficiency?

– What metrics/KPIs are needed for environmental efficiency, particularly in terms of water and energy efficiency of telecommunications/ICTs including data centres?

– What metrics/KPIs are needed for related measurement methods and reference values for power/cooling systems used in telecom and data centre installations?

– What are the technical specifications and best practices for energy consumption/efficiency of new and emerging telecommunication and ICTs, as well as related components and installations like next-generation telecommunication networks, data centre infrastructures, and radio sites?

– How can energy efficiency control and monitoring solutions be implemented to reduce the environmental impact of ICT installations and telecommunications/ICTs, including data centres?

– How can real-time energy consumption and carbon emissions of ICT infrastructure and even entire networks be visualized during operation?

– What energy efficiency solutions can be defined for telecommunications/ICTs by integrating artificial intelligence, machine learning and big data to reduce consumption and emissions?

– How, from an environmental efficiency standpoint, can the future network architecture proposed by other SGs, SDOs and forums be evaluated and analysed?

– What green and low carbon requirements and suggestions should be considered for network deployment and facilities solutions for new and emerging telecommunications/ICTs (e.g., AI, IoT, 5G/IMT2020 and beyond)?

– What recommendations, supplements, or technical reports are required to reduce energy consumption through hardware optimization design for ICT sector infrastructures and facilities, including ICT equipment, power systems, cooling systems, and management systems, while aligning with the goals of the UNFCCC Paris Agreement to reduce CO2 emissions?

– How can power and cooling systems in ICT networks be improved for energy efficiency and reduced carbon emissions, including features covering power feeding systems, air flow control technology, cooling technology, and renewable energy systems?

– What strategies can be employed to increase broadband coverage while providing affordable, environmentally efficient ICT equipment and infrastructures in rural areas?

– What Recommendations, Supplements or Technical Reports are required for specifications of configuration and installation of power feeding systems in DC or hybrid AC and DC, including cable distribution methods, basic concepts (or architectures) of the power supply network for environmentally sustainable and low-cost solutions?

– What Recommendations, Supplements or Technical Reports are needed to provide guidance on how to facilitate the use of renewable energy in the ICT sector and strategies related to the supply chain?

– What are the requirements for the application of smart renewable energy solutions in ICT installations, including data centres, IoT, M2M, radio sites, and customer sites?

#### E.3 Tasks

Tasks include, but are not limited to:

– Develop Recommendations and Supplements on water efficiency and energy efficiency metrics and measurements for telecommunications/ICTs, including new radio access (5G/IMT2020 and beyond), related supporting network elements and the metaverse;

– Develop Recommendations, Supplements and/or Technical Reports on the construction of green and low-carbon sites, telecommunication room and data centre;

– Develop Recommendations, Supplements and/or Technical Reports to support the implementation of smart energy solutions (including cooling solutions);

– Develop Recommendations on water and energy efficient solutions for widespread ICT network implementation in order to improve the efficient use of energy and resources including IoT and 5G/IMT2020 and beyond;

– Develop Recommendations, Supplements and Technical Reports on control and monitoring solutions for facilities equipment and Power, Environmental, Energy (PEE) parameter telecommunications/ICTs, radio access (including 5G/IMT2020 and beyond), the related supporting networks and the metaverse;

– Develop Recommendations, Supplements and/or Technical Reports that contain requirements and technical specifications on low-cost, portable, and environmentally efficient ICT infrastructure for rural areas and communities in close cooperation with other Study Groups and SDOs operating in this area;

– Develop Recommendations Supplements and/or Technical Reports on new energy-saving solutions and low carbon emission solutions, including key parameter requirements for telecommunication/ICTs equipment, network and deployment, including Data Centres;

– Develop Recommendations, Supplements and/or Technical Reports on smart energy technologies and solutions for telecommunications/ICTs (including data centre, 5G/IMT2020, big data, artificial intelligence, blockchain);

– Develop Recommendations, Supplements and/or Technical Reports to improve the energy efficiency of ICT equipment through, for example, smart power management;

– Develop Recommendations, Supplements and/or Technical Reports on facilitating the use of renewable energy in the telecommunications/ICTs sector and developing strategies related to supply chain;

– Analyse the environmental efficiency of basic future network architecture developed by other study groups, SDOs and forums, and provide requirements and suggestion to be considered for a low-carbon and environmentally sustainable network deployment;

– Maintain and revise existing Recommendations and other deliverables as needed.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=6/5>).

#### E.4 Relationships

WSIS Action Lines:

– C2, C7

Sustainable Development Goals:

– 7, 9, 11, 13

Recommendations:

– ITU-T K-series

– ITU-T L-series

Questions:

– QF/5, QG/5, QH5, QI/5

**Study Groups:**

– ITU-T SGs

– ITU-D SGs

– ITU-R SGs

Other bodies:

– ATIS

– CCSA

– ETSI

– ECMA

– IEC

– IETF

– ISO

– CIAJ

– GISFI

– 3GPP

– TSDSI

– IEEE

– CESI

### F DRAFT QUESTION F/5 E-waste, circular economy, and sustainable supply chain management

(Continuation of Question 7/5 and part of Question 13/5)

#### F.1 Motivation

New and emerging telecommunications/ICTs (including existing solutions) are at the centre of a new economic model that is based on a knowledge and information society. Mobile phones, tablets and computers are giving people access to social, public and financial services that otherwise would not be available to them. ICTs also provide the communication functions allowing digital platforms and IoT devices to communicate with one another.

All this implies there is a steady growth in global production and sale of electrical and electronic equipment (EEE), particularly those related to ICT - computers, printers, mobile phones, fixed phones, and tablets. Compounded by rapid innovation and lowering costs, this increasing demand for EEE has become a major source of waste (e-waste).

E-waste has already become the fastest growing waste stream. In 2022, a record 62 billion kg of e-waste was generated globally (equivalent to an average of 7.8 kg per capita per year); 22.3 per cent of this e-waste mass was documented as formally collected and recycled in an environmentally sound manner..[[2]](#footnote-2)[[3]](#footnote-3) Improperly disposing of e-waste poses serious risks to the environment and to human health.

This Question seeks to address the e-waste challenge by identifying the environmental requirements of new and emerging telecommunications/ICTs including IoT, end-user equipment and ICT infrastructures or installations, based on the circular economy principles and improving the supply chain management to ensure securing stable resources.

The circular economy creates and captures new value for businesses and adds extra dimensions to supply chains.

Supply chain management involves the management of the entire lifecycle process of goods or services, from selecting raw materials, and applying design principles to delivering the final product. Given this scope, supply chain management plays a critical role in improving the environmental performance of most technologies including ICTs. This means optimizing energy efficiency, improving circularity and reducing the environmental burden linked to the manufacture, use and recycling of these technologies including ICTs.

Developing a 21st century, high-quality recovery process for the valuable materials from electronic waste is very important, especially when considering the global e-waste volumes and their flows. This offers a variety of potential opportunities in urban mining which are based on the global quantities of e-waste, as well as measures that can be taken to establish appropriate infrastructures to reduce the toxicity of some e-waste fractions.

By promoting sustainable urban mining and recycling, such valuable resources not only support a more circular economy but also drive new opportunities in social businesses.

In addition, it is recognized that counterfeit telecommunication/ICT products and devices have become a growing problem in the world. This is known to adversely affect all stakeholders in the ICT field (vendors, governments, operators and consumers).

NOTE – Counterfeit ICT devices include counterfeit and/or copied devices and equipment, as well as accessories and components.

In this regard along with impeding innovation, these counterfeit devices affect economic growth and intellectual property rights. These counterfeit devices are also often hazardous to health and safety and have a negative impact on the environment and the increasing amount of harmful e‑waste. In addition, this Question will work on the development of eco-rating programmes which will help users to make more informed choices. This will offer opportunities for companies to define a common approach regarding the enhanced environmental performances of goods, networks and services in line with the principle of conscious development and user information.

The circular economy principles hold great potential in improving sustainability in cities and communities. Sharing, recycling, refurbishing, re-using, servitizing, replacing and digitizing are identified as some of the circular actions that can be applied to a wide range of ICTs and city assets. Any practices that enable more sustainable environmental styles of life are essential. City assets in this case may refer to city infrastructure such as buildings, public spaces, water, energy, and mobility infrastructure, city resources such as natural resources and private sector assets, and city goods and services such as economic goods and services consumed in a city that embeds ICTs.

Circular and sustainable actions in different city assets allow the unlocking of a wide range of economic, environmental and social benefits that would greatly improve the sustainability of a city or community and building climate resilience at the same time. Circular actions increase city assets’ and products’ efficiency and effectiveness by extending their utilization and lifetimes. As a result, less material is needed to produce the same products with less waste being generated.

In a circular and sustainable city or community, materials and resources stay in use for as long as possible. Buildings and public infrastructure (i.e., city assets) are designed to be more energy efficient, durable, adaptable and easy to maintain. Natural rainfalls and liquid waste would be recovered as much as possible by green roofs or other urban spaces, while smart meters reduce water wastage and optimise water distribution. Green spaces may be used for different social activities at different time. Extra electric vehicle charging stations may be added along with an effective and efficient public transport system to promote smart mobility. Renewable energy would also be primarily form of energy supply that power a circular city. This Question is also in line with the Sustainable Development Goal 12, target 12.5: by 2030, substantially reduce waste generation through prevention, reduction, recycling, and re-use.

Promoting circular design combined with responsible e-waste management will not only reduce e-waste but will also help curb the other negative impacts related to the use of ICTs worldwide.

The following Recommendations, Handbooks and Supplements, in force at the time of approval of this Question, fall under its responsibility:

– ITU-T L.24, L.1000, L.1001, L.1002, L.1005, L.1006, L.1007, L.1010, L.1015, L.1017, L.1020, L.1021, L.1022, L.1023, L.1024, L.1027, L.1028, L.1030, L.1031, L.1032, L.1033, L.1034, L.1035, L.1036, L.1040, L.1050, L.1060, L.1061, L.1070, L.1071, L.1100, L.1101, L.1102; L.1604, L.1610; 1620, L.1630, L.1631;

– L-series Supplements 4, 5, 20, 21, 27, 28, 32;

– Handbooks on the Preservation of Wooden Poles carrying Overhead Telecommunication lines;

– Handbooks on Protection of Telecommunication Buildings from Fire.

#### F.2 Questions

Study items to be considered include, but are not limited to:

– How to ensure the health and environmental performance of new and emerging telecommunications/ICT equipment, services and facilities, including the avoidance of virgin and hazardous materials and final disposal through standards?

– How to ensure that new and emerging telecommunications/ICT equipment and facilities cause minimum environmental and health impact on the entire lifecycle including design, production, usage and use of materials applying the circular economy concept?

– How to mitigate the environmental and health impacts caused by improper handling of e‑waste?

– How to measure and predict the e-waste reducing effect of ICT induced by dematerialization?

– What are the guidelines and design frameworks required to new and emerging telecommunications/ICT products that are in favour of end-of-life easy dismantling and high level of re-use of its components and materials (e.g. to promote eco-designs)?

– How to implement the circular economy principles (reduce, re-use, recycle and recover) into e-waste management with a special focus on developing countries?

– How to implement the circular economy principles (reduce, re-use, recycle and recover) to achieve a sustainable supply chain to ensure the availability of stable resources?

– How to include circular design criteria into product design and manufacturing?

– What are the requirements and sustainable solutions to deal with counterfeit ICT devices and reduce e-waste?

– What are the programmes (such as eco-labels or DPP) that would encourage users to take responsible purchasing decisions?

– What are the solutions and information that are needed to implement digital product passports covering the sustainable performance of ICTs including facilities equipment and solutions?

– How to evaluate and guide the upgrades and replacements of key elements of the existing ICT network infrastructure to achieve higher environmental efficiency and lower material usage and environmental footprint?

– What rare metals or raw materials are the prime targets for urban mining? What guidelines or Recommendations are needed to ensure safe extraction of these metals when urban mining? What guidelines are needed to the ICT sector to comply with regulatory requirements?

– What guidelines or Recommendations are needed for battery recycling and optimizing battery solutions?

– How can we provide guidelines to stakeholders to ensure they accurately communicate information about the effects and opportunities in e-waste management?

– How can the integration and re-use of existing network elements, even from previous generations, be studied and promoted to ensure compatibility with the latest new and emerging telecommunications/ICTs (including existing solutions) while minimizing energy consumption and environmental impact?

– What guidelines need to be developed for creating green and low-carbon new product iterations for the global ICT industry and supply chains? Additionally, what guidance can be provided for the technological evolution pathway to phase out outdated, inefficient, and high-technologies and product?

– What is the impact of implementing circularity in cities on improving sustainability?

– What are the guidelines, frameworks and best practices required to apply circular economy principles into different city assets (i.e., buildings, transport, water, energy, digital and public infrastructures, waste management, natural resource management)?

– What Recommendations, Supplements and Technical Reports should be developed for supporting the transition to a circular city?

– How to utilize the circular economy as a means of securing stable resources to cope with supply chain risks?

#### F.3 Tasks

Tasks include, but are not limited to:

– Develop Recommendations and/or Supplements and/or Technical Reports to determine processes to minimize the environmental (including health) impact of products (including avoidance of hazardous and virgin materials). This may also include Recommendations and/or Supplements on manufacturing processes, operational procedures, and disposal of end-of-life equipment;

– Develop Recommendations, Supplements and/or Technical Reports to identify new technologies and/or compounds/materials and operational processes to use that minimize environmental (including health) impact. This may require the identification of market needs and provide timely standardization solutions;

– Develop Recommendations, Supplements and/or Technical Reports on solutions to mitigate e-waste, which encourage the re-use of product common parts and helps to unlock the full potential of the circular economy;

– Develop Recommendations, Supplements and/or Technical Reports on battery optimization including recycling impacts and solutions to reduce battery waste. This should cover the stationary battery in ICT networks and battery packs external to devices, as well as internal batteries;

– Develop Recommendations, Supplements and/or Technical Reports on circular lifecycle approach for ICT equipment to minimize environmental and health impact;

– Develop Recommendations, Supplements and/or Technical Reports on material supply chains, including rare metals, and guidance and solutions to reduce the impact of new and emerging telecommunications/ICTs (including existing solutions) organizations and achieve a circular economy;

– Develop Supplements and/or Technical Reports which provide effective guidelines on e‑waste management for different ITU regions and aim to achieve a circular economy;

– Develop standardized training modules to provide guidance on e-waste management/circular economy standards and guidelines;

– Develop Recommendations, Supplements and/or Technical Reports on circular economy requirements and how new and emerging telecommunications/ICTs could contribute to a circular economy;

– Develop Recommendations, Supplements and/or Technical Reports on safe and eco/energy-efficient re-use and recycling practices and technical requirements for managing e-waste in a socially responsible manner including guidance to the informal sector[[4]](#footnote-4) on environmentally sound management of e-waste;

– Develop Recommendations, Supplements and/or Technical Reports to study and analyse the effects of counterfeit equipment in relation with e-waste and their environmental impact;

– Develop Recommendations, Supplements and/or Technical Reports on requirements for sustainable batteries used in ICT products considering the EoL cycle and the material usage;

– Develop Recommendations, Supplements and/or Technical Reports on circular economy KPI/metrics within telecommunications/ICTs;

– Develop Recommendations, Supplements and/or Technical Reports on key eco-rating programmes aimed to raise awareness on sustainability with a view to harmonize existing eco-rating schemes;

– Develop Recommendations, Supplements and/or Technical Reports that assess and promote environmental sustainability within the ICT supply chain moving to a circular economy;

– Develop Recommendations, Supplements and/or Technical Reports that promote and provide guidance on telecommunications/ICTs procurement practices that enhance environmental sustainability moving to a circular economy;

– Develop Recommendations, Supplements and/or Technical Reports related to implement the circular economy principles in product design phases of ICT product;

– Develop Recommendations, Supplements and/or Technical Reports related to circular design criteria into product design and manufacturing of ICT product;

– Develop Recommendations, tools, Supplements and/or Technical Reports on guidelines to stakeholders giving correct information on e-waste management effects and opportunities;

– Develop Recommendations, supplements and technical reports on upgrades and replacements of key elements of the existing ICT network infrastructure to achieve higher energy efficiency and lower material and emissions footprint;

– Develop Recommendations, supplements and technical reports on the definition and implementation of digital product passports covering the sustainable performance of ICT including facilities equipment and solutions, e.g., cooling solution, power feeding solution site and data centre structure;

– Develop Recommendations, Supplements and/or Technical Reports that contain requirements, technical specifications, and effective frameworks for applying circular economy principles for new and emerging telecommunications/ICTs applications in cities and communities;

– Develop Recommendations, Supplements and/or Technical Reports that provide guidance on applying circular economy principles for new and emerging telecommunications/ICTs applications in the following areas: buildings, transport, water, energy, digital and public infrastructures, waste management, natural resource management, and more;

– Develop metrics and key performance indicators that establish baseline scenarios of circular cities and communities with the use of new and emerging telecommunications/ICTs applications;

– Develop Recommendations, Supplements and/or Technical Reports on guidelines for enhancing supply chain transparency and managing risk to improve the circular economy;

– Maintenance and revision of existing Recommendations, Supplements and Technical Reports.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=7/5>).

#### F.4 Relationships

WSIS Action Lines:

– C2, C4, C7

Sustainable Development Goals:

– 11, 12, 13

Recommendations:

– ITU-T L-series

– ITU-T K-series

Questions:

– QA/5, QE/5, QH/5, QI/5, QJ/5

Study Groups:

– ITU-T SGs

– ITU-D SGs

– ITU-R SGs

Other bodies:

– IEC TC46, TC100, TC 111

– CENELEC TC111X, CEN/CENELEC JTC 10

– IEEE

– ETSI TC EE, TC ATTM

– GSMA

– UNEP/Secretariat of the Basel Convention

– UNU

– ISO/TC 184

### G DRAFT QUESTION G/5 Guidance and terminology on environment

(Continuation of Question 8/5)

#### G.1 Motivation

To be useful to stakeholders, guidance is needed to locate a specific topic of interest, and the terminology used should harmonise within ITU-T Study Group 5 and with what is used in other international standards development organizations.

ITU-T Study Group 5 has published, as a Guide, an overview of ITU-T K-series documents, which provides information on measures to achieve electromagnetic compatibility for telecommunication equipment and installations. This Question is responsible to keeping this guide updated.

ITU-T Study Group 5 also covers information and communications technologies (ICTs) (including new and emerging technologies), EMC, EMF, and environment and climate change (CC) including circular economy to reach Sustainable Development Goals.

ITU-T Study Group 5 has published several Recommendations and other deliverables that need to be maintained.

The following deliverables, in force at the time of approval of this Question, fall under its responsibility:

– ITU-T Recommendation K-series: Protection against interference;

– ITU-T Recommendations L-series on construction, installation and protection of cables and other elements of outside plant, such as ITU-T L.1, L.3, L.4, L.5, L.6, L.7, L.8, L.9, L.18, L.19, L.71, L.75 and L.76;

– ITU-T Recommendations L-series on environment and ICTs, climate change, e-waste, energy efficiency;

– Guide to the use of ITU-T Publications produced by ITU-T Study Group 5 aimed at achieving electromagnetic compatibility and safety;

– Technical Papers and Supplements;

– Handbook on Jointing of Plastic-Sheathed Cables;

– Handbook on Outside Plant Technologies for Public Networks;

– Compendium of Cable Measurement Methods;

– Guides on the use of ITU-T Study Group 5 publications.

#### G.2 Questions

Study items to be considered include, but are not limited to:

– All terms, definitions, abbreviations, letter symbols and schematic symbols used in the ITU‑T Study Group 5 Recommendations, Supplements, and other deliverables;

– Harmonize with terminology used by other relevant parties outside of ITU-T Study Group 5;

– Liaise with other bodies regarding terminology used in the ITU-T Study Group 5 Recommendations.

– To create an ITU deliverable containing the existing environmental KPIs and performance methodologies defined by ITU-T Study Group 5 and if possible KPIs and performance methodologies related to environment defined by any other ITU-T Study Groups.

– To establish and maintain information sharing between ITU-T Study Group 5 and other groups within and outside ITU, for example SDOs, and relevant stakeholders.

– What ITU website application could be used to obtain information related to *KPIs and performance methodologies?*

– Create a Technical Report on “Use of ITU-T SG5 Recommendations and Supplements” in order to get feedback of experts and practitioners on the implementation of SG5 Standards.

#### G.3 Tasks

Tasks include, but are not limited to:

– Monitor and advise on terminology used for terms, definitions, abbreviations, letter symbols and schematic symbols in ITU-T Study Group 5 publications; see the “Motivation” section above;

– Monitor and try to harmonise terminology usage with other standards development organizations;

– Respond to or create liaisons with other bodies regarding terminology;

– Enhancement of the ITU-T Study Group 5 publications;

– Develop and maintain Guides to ITU-T Study Group 5 publications;

– Maintain Study Group 5 orphan publications, such as ITU-T Recommendation L series;

– Transition publication and terminology Guides to be suitable for enhancing ITU-T Study Group 5 web presence;

– Participate with the ITU Standardization Committee for Vocabulary (SCV) and the ITU-R Coordination Committee for Vocabulary (CCV) activities;

– Develop Recommendations, technical report and supplements on *KPIs and performance methodologies*.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=8/5>).

#### G.4 Relationships

WSIS Action Lines:

– C5

Sustainable Development Goals:

– 11, 13

Recommendations and Publications:

– Recommendations and all other documents produced by or referenced by SG5

Questions:

– All SG5 Questions

Study Groups:

– ITU-T SGs

– ITU-R SGs

– ITU-D SGs

Vocabulary:

– ITU-T Standardization Committee for Vocabulary (SCV): <https://www.itu.int/en/ITU-T/committees/scv>

– ITU-R Coordination Committee for Vocabulary (CCV): <https://www.itu.int/en/ITU-R/study-groups/rccv>

– ITU terms and definitions: <https://www.itu.int/br_tsb_terms/>

– IEC Electropedia: <https://www.electropedia.org/>

– IEC Glossary: <https://std.iec.ch/glossary>

– FranceTerme: <http://www.culture.fr/franceterme>

– IEEE Standards Dictionary: <https://ieeexplore.ieee.org/xpls/dictionary.jsp>

Other bodies:

– IEC

– ISO

– IEEE-SA

– ETSI

– Other relevant standardization organizations

### H DRAFT QUESTION H/5 Assessing the impact of telecommunications/ICTs on climate change, biodiversity and the environment - including the influence on other sectors

(Continuation of Question H/5)

#### H.1 Motivation

Question H/5 aims to develop assessment methodologies and guidance that allow the objective, transparent and practical assessments of the sustainability impacts of, for example, telecommunications/ICTs, artificial intelligence, and 5G, in order to align their developmental trajectories with the Paris Agreement and the United Nations Sustainable Development Agenda.

Also taking into account the importance of climate change and biodiversity challenges as stressed by the IPCC 1.5-degree Special Report and the IPBES May 2019 Report on the severity of biodiversity loss and damages, and planetary limits assessments, Question H/5 intends to particularly focus on these two topics as well.

The ICT sector has the responsibility to limit its own lifecycle impacts on climate change, biodiversity, and other environmental aspects. In parallel, the ICT sector can contribute to changing the current unsustainable consumption and production patterns, strengthening scientific, technological, innovative capacities, and supporting the implementation of the latest technologies that have been demonstrated to be sustainable.

Moreover, the ICT sector has a unique opportunity to shape behaviours in a more sustainable direction by accelerating climate change adaptation and mitigation actions, and other sustainability improvement ICTs are providing technologies that enhance the developments of climate models including emission trends in other sectors.

This Question also aims to study how environmental assessments may be used in the frame of broader sustainable development assessments including economic, environmental, and social assessments.

The Question is also in line with the Sustainable Development Goals: SDG 9 “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”; SDG 11 “Make cities and human settlement inclusive, safe, resilient and sustainable” and SDG 13 “Take urgent action to combat climate change and its impact”.

The following Recommendations and Supplements, in force at the time of approval of this Question, fall under its responsibility:

– ITU-T L.1400, L.1410, L.1420, L.1430, L.1440, L.1450, L.1451, L.1460, L.1470, L.1471, L.1480;

– L-series Supplements 2, 3, 13, 26, 34, 37, 38. 57 and 60.

#### H.2 Questions

Study items to be considered include, but are not limited to:

– Examine how to assess the climate, biodiversity and other environmental impact, of telecommunications/ICTs, including those which make use of artificial intelligence, IoT, 5G, etc., at different levels – including rebound effects;

– Develop and provide detailed guidance on assessing the benefits brought by ICT goods, networks, and services in decarbonizing other economic sectors;

– Develop Recommendations and guidelines in the frame of Sustainable Development Goals (SDGs) and the Paris Agreement to support climate change mitigation actions, reach IPBES Biodiversity objectives, and stay within the planetary boundaries;

– Develop and update GHG emissions trajectories for at least 2030, 2040, 2050 and/or 2060 for the ICT sector, sub-sectors and organizations and provide targets guidance;

– Provide guidance and assistance for the regular, possibly yearly, assessment of the lifecycle GHG emissions of the ICT sector and sub-sectors worldwide;

– Provide guidance on the contents of an ITU database on GHG emissions worldwide, nationwide and potentially, emission factors;

– Develop and provide detailed guidance on recommended actions to follow in order to reach the 1.5°C trajectories described in Recommendation ITU-T L.1470, in collaboration with the relevant stakeholders;

– Explore how environmental assessments methodologies may be used in the frame of broader sustainable developments assessments including economic, environmental and social assessments;

– Establish a fact base regarding ICT in the frame of TCFD, regional taxonomies and similar initiatives from international organizations, governments, finance, and insurance sectors and develop guidance on how ICT actors can respond;

– Provide guidance towards end-users on the way for them to use ICT services in order to limit the GHG emissions resulting from these ICT services, while experiencing a similar or improved performance.

#### H.3 Tasks

Tasks include, but are not limited to:

– Develop Recommendations, Supplements and/or Technical Reports on GHG emissions trajectories for at least 2030, 2040, 2050 and/or 2060 for the ICT sector, sub-sectors and organizations and provide targets guidance;

– Develop Recommendations on the methodologies to assess the positive/secondary effects/higher order effects environmental effects of telecommunications/ICTs (including those which make use of AI) in other sectors of the economy;

– Develop Recommendations, Supplements and/or Technical Reports on the assessment of the benefits brought by ICT services in decarbonizing other economic sectors;

– Develop Recommendations, Supplements and/or Technical Reports on the methodology for the assessment of the GHG emissions of telecommunications/ICTs at country/sector level, in line with the UNFCCC Paris Agreement;

– Develop Recommendations, Supplements and/or Technical Reports on the methodology for the assessment of the biodiversity impact of telecommunications/ICTs at country/sector level in line with the IPBES recommendations and CBD framework;

– Develop Recommendations, Supplements and/or Technical Reports to provide guidance on the ICT related assessment of environmental impacts such as rare metals depletion, biodiversity loss, ecosystems services impact, abiotic resources depletion, water eutrophication and soil contamination as applicable;

– Develop Recommendations, Supplements and/or Technical Reports for the regular, possibly yearly, assessment of the lifecycle GHG emissions of the ICT sector and sub-sectors worldwide;

– Develop Recommendations, Supplements and/or Technical Reports on recommended actions to follow in order to reach the 1,5°C trajectories described in ITU-T L.1470, in collaboration with the relevant stakeholder;

– Develop Recommendations, Supplements and/or Technical Reports to assess the GHG emissions of telecommunications/ICTs at different levels (e.g., country, city, communities, industry etc), taking into account the Sustainable Development Goals (e.g., Paris Agreement, etc.) as applicable;

– Develop Recommendations, Supplements and/or Technical Reports on a fact base regarding ICT in the frame of IFRS, regional taxonomies and similar initiatives from international organizations, governments, finance, and insurance sectors and develop Recommendations, Supplements and/or Technical Reports on how ICT actors can respond;

– Develop Recommendations, Supplements and/or Technical Reports on the way for end-users to use ICT services in order to limit the GHG emissions resulting from these ICT services, while experiencing a similar or improved performance;

– Develop Recommendations, Supplements and/or Technical Reports on how to establish and maintain an ITU database on ICT sector GHG emissions at national and worldwide level, and, potentially, emission factors;

– Revise existing Recommendations related to the assessment of the environmental impact of ICT as required, based on the practical experience of the methodologies gained by ITU-T Members, and taking into account developments in other forums and SDOs;

– Maintain and revise existing Recommendations and other deliverables as needed.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=9/5>).

#### H.4 Relationships

WSIS Action Lines:

– C2, C7

Sustainable Development Goals:

– 7, 11, 13

Recommendations:

– L-series

Questions:

– QE/5, QF/5, QI/5, QJ/5

Study Groups:

– ITU-T SGs 13, 15, 16 and 20

– ITU-D

– ITU-R

Other bodies:

– CBD

– IFRS

– ISO

– IEC

– ETSI

– UNFCCC

– IPCC

– UNIDO

– UNECE

– UNEP

– WEF

– WBCSD

– WRI

– ULE

– CDP

– WMO

– ICC

– IEA

– GeSi

– SBTi

– IPBES

– UICN

– FutureEarth

– SBTi

– SBT for Nature

### I DRAFT QUESTION I/5 Climate change mitigation and smart energy solutions

(Continuation of part of Question 11/5)

#### I.1 Motivation

Question I/5 aims to develop standards, guidance, supplements and/or technical reports to create a smart energy solutions using new and emerging telecommunications/ICTs including those which make use of artificial intelligence.

It is increasingly recognized that global climate change will have a significant impact on global society, especially the energy sector. The energy industry includes the electricity and fuels that drive society and the economy, including commerce, manufacturing, transportation, communications, health, water supply and treatment, and other critical infrastructure and systems. It is becoming clear that there is a possibility of disruption in the energy system due to climate change, which influences the quality of life. In particular, climate change can increase the frequency and intensity of various natural phenomena such as earthquakes, high temperatures, heavy rain, strong winds, storms and floods.

Since various energy systems are often installed outdoors, they are vulnerable to the natural phenomena. The vulnerability to the natural phenomena should be considered during the design and operation of energy systems. However, energy management systems using the conventional ICTs in energy industry does not consider the vulnerability. The energy management systems can be improved by new and emerging telecommunications/ICTs. Furthermore, greenhouse gas emissions from the energy industry account for about one third of total emissions. In order to tackle such climate change, various methods including smart energy solutions are being developed.

Smart energy solutions connect energy supply and demands through ICT network and grid. They monitor the optimal usage of energy, promote balancing supply and demand based on real-time information collected using new and emerging telecommunications/ICTs such as sensors and meters, etc. Smart energy solutions have different characteristics from the conventional electrical grids. The co-existence of conventional electrical grid systems and smart energy solutions can introduce new issues. For example, wind or solar power generation exhibits intermittency of power generation; consequently, applying these smart energy solutions to transportation, building, manufacturing industry, etc., requires new operational management considerations.

In the view above, this Question seeks to develop standards, guidelines and frameworks that support the digital transition of energy industry using new and emerging telecommunications/ICTs and apply smart energy solutions to transportation, building, manufacturing industry, etc., in order to achieve more effective and efficient energy management and reduce greenhouse gas emissions.

This Question is in line with the following Sustainable Development Goals: SDG 7 “Ensure access to affordable, reliable, sustainable and modern energy for all”; SDG 9 “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”; SDG 11 “Make cities and human settlement inclusive, safe, resilient and sustainable” and SDG 13 “Take urgent action to combat climate change and its impact”.

The following Recommendations and Supplements, in force at the time of approval of this Question, fall under its responsibility:

– L.1220, L.1221, L.1222, L.1383

#### I.2 Questions

Study items to be considered include, but are not limited to:

– What Recommendations, Supplements or Technical Reports are needed to provide guidance on how to facilitate the use of smart energy solutions for, for example, transportation, building, manufacturing industry, and strategies related to supply chain?

– What Recommendations, Supplements or Technical Reports are needed for digital transition of energy industry using new and emerging telecommunications/ICTs for climate change mitigation in energy industry to achieve sustainable energy management and services?

– What Recommendations, Supplements or Technical Reports are needed for effectively managing transportation, building, manufacturing industry, etc., where the conventional grid systems and smart energy solutions coexist?

– What Recommendations, Supplements or Technical Reports are needed for specifications of configuration and installation of power feeding systems in DC or hybrid AC and DC, including cable distribution methods, basic concepts (or architectures) of the power supply network in transportation, building, manufacturing industry, etc.?

– What Recommendations, Supplements or Technical Reports are needed for specifications of interfaces and protocols for power feeding systems?

#### I.3 Tasks

Tasks include, but are not limited to:

– Develop Recommendations, Supplements and/or Technical Reports to set the requirements for smart energy solutions which contribute to mitigating climate change using new and emerging telecommunications/ICTs in transportation, building, manufacturing industry, etc.;

– Develop Recommendations, Supplements and/or Technical Reports to support the use and implementation of smart energy solutions in transportation, building, manufacturing industry, etc., and development of strategies related to supply chain;

– Develop Recommendations, Supplements and/or Technical Reports to promote balancing supply and demand with telecommunications/ICTs such as utilizing ICT sites as a micro-grid and virtual power plant;

– Develop Recommendations, Supplements and/or Technical Reports on utilizing energy in ICT such as data centre heat to other industries such as transportation, building, manufacturing industry, etc.;

– Develop Recommendations, Supplements and/or Technical Reports on energy management system using new and emerging telecommunications/ICTs for transportation, building, manufacturing industry, etc.;

– Develop Recommendations, Supplements and/or Technical Reports to promote climate change mitigation in the energy industry by improving the energy efficiency of various equipment/systems using telecommunications/ICTs;

– Develop Recommendations Supplements and/or Technical Reports on the characterizations and specifications of the energy storage evaluation and power system configurations, architectures and cable distributions of the DC or hybrid AC and DC power feeding system considering the interconnection to smart grids and smart energy solutions;

– Develop Recommendations Supplements and/or Technical Reports on the characterizations and specifications of interfaces and protocols for power feeding systems considering the interconnection to smart grids and smart energy solutions;

– Develop Recommendations Supplements and/or Technical Reports on new energy saving solutions and low carbon emission smart energy solutions to other sectors, including key parameter requirements of new and emerging telecommunications/ICTs;

– Maintenance and revision of existing Recommendations and other deliverables.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=11/5>).

#### I.4 Relationships

WSIS Action Lines:

– C2, C7

Sustainable Development Goals:

– [7, 9, 11, 13](file:///C:/Users/ubeda/AppData/Local/Microsoft/Windows/INetCache/Content.Outlook/M79BDJPV/SDG%207)

Recommendations:

– ITU-T K-series

– ITU-T L-series

Questions:

– QE/5, QF/5, QH/5, QJ/5

Study Groups:

– ITU-T SGs

– ITU-D SGs

– ITU-R SGs

Other bodies:

– ATIS

– CCSA

– ETSI

– ECMA

– IEC

– IETF

– ISO

– ISO/IEC JTC 1

– CIAJ

– GISFI

– 3GPP

– TSDSI

– IEEE

– CESI

– TTA

– MCMC

### J DRAFT QUESTION J/5 Climate actions and adaptation to climate change through sustainable and resilient telecommunications/ICTs (including new and emerging)

(Continuation of part of Question 12/5 and Question 13/5)

#### J.1 Motivation

Telecommunications/ICTs (including new and emerging) can be effective in enabling countries and cities to better mitigate and adapt to climate change. Mitigation and adaptation involve taking action to tolerate the effects of climate change on a local, city, country, regional and international level. Examples include remote sensing for monitoring of natural disasters such as earthquakes and tidal waves, and improved communications to help deal with natural disasters more effectively.

Telecommunications/ICTs (including new and emerging), and satellite and surface-based remote sensors in particular, are already the main tools for environmental observation, climate monitoring and provide data for climate change prediction on a global basis. The modern disaster prediction, detection and early warning systems based on the use of telecommunications/ICTs (including new and emerging) are essential for saving lives and should be provided where needed, including developing countries.

ICTs can also play a crucial role in supporting the whole society to mitigate and adapt to the effects of climate change. At the heart of climate change mitigation is to reduce carbon emissions. Telecommunications/ICTs (including new and emerging) are the key enabler for creating a sustainable, efficient, cost effective and intelligent industries.

Remote sensing and geographic information systems make vital climate and disaster information available for early warning systems to deliver alerts to communities that are at risks in a timely manner. ICT devices grant rural citizen access to the latest climate information that allows them to take pre-emptive measures before any natural hazard strikes. This is particularly crucial to coastal cities that are particularly vulnerable to raising sea-level. Urban drought, desertification and extreme heat are also increasingly pushing rural citizens to live under water-stress conditions.

The effects of climate change often disproportionally impact rural areas, cities and communities.

Firstly, telecommunications/ICTs (including new and emerging) play a crucial role in the transition to a circular and sustainable city. They optimize the utilization of city assets and enable energy and resource efficiency. In a circular and sustainable city or community, materials and resources stay in use for as long as possible. Buildings and public infrastructure (i.e., city assets) are designed to be more energy efficient, durable, adaptable and easy-to-maintain. Natural rainfalls and liquid waste would be recovered as much as possible by green roofs or other urban spaces, while smart meters reduce water wastage and optimise water distribution. Green spaces may be used for different social activities at different time. Extra electric vehicle charging stations are added, along with an effective and efficient public transport system to promote smart mobility. Renewable energy would also be primarily form of energy supply that power a circular city. These areas often lack the social and economic resources to enhance climate resiliency.

This leads to a series of challenges that are barring rural communities from taking advantage of telecommunications/ICTs (including new and emerging) in mitigation and adaptation to the effects of climate change. While half of the world's population is now connected to the Internet, the other half remains offline.[[5]](#footnote-5) Many inhabitants of rural areas cannot afford the Internet and are being left behind as the digital revolution continues to advance. Without access to mobile phones, the Internet, or other basic ICT devices, rural citizens would not be able to anticipate upcoming climate disasters and take adaptive measures accordingly.

Question J/5 aims to develop Recommendations, Supplements and/or Technical Reports that support enablement of telecommunications/ICTs (including new and emerging) to accelerate climate mitigation and adaptation actions. Particular emphasis has been placed on expanding the digital sustainable transition of rural communities and areas, circular and sustainable cities to build and maintain climate resilient societies.

ICTs can promote other sectors to adapt to the adverse impacts of climate change with, for instance, but not limited to, early warning systems, smart agriculture applications, building optimization, etc.

Question J/5 covers the actions to be undertaken by the ICT sector to anticipate and adapt itself to these adverse effects (i.e., ICTs resilient to floods and high temperature, etc.).

Telecommunications/ICTs (including new and emerging) provide an exceptional opportunity to improve the creation, management, exchange and application of relevant climate change information and knowledge on ICT-based climate change adaptation measures.

This Question is in line with the following Sustainable Development Goals: SDG 7 “Ensure access to affordable, reliable, sustainable and modern energy for all”; SDG 9 “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”; SDG 11 “Make cities and human settlement inclusive, safe, resilient and sustainable”, SDG 12 “Ensure sustainable consumption and production patterns” and SDG 13 “Take urgent action to combat climate change and its impact”.

The following Recommendations and Supplements, in force at the time of approval of this Question, fall under its responsibility:

– ITU-T L.2, L.4, L.20, L.21, L.22, L.23, L.32, L.33, , L.1700, L.1500, L.1501, L.1502, L.1503, L.1504, L.1505, L.1506, L.1507;

– L-series Supplements 14, 15, 22, 23, 24, 25, 29, 30, 31, 46.

**J.2** **Questions**

Study items to be considered include, but are not limited to:

– What are the technological, social, and economic challenges that communities are facing when it comes to climate change adaptation?

– How can telecommunications/ICTs (including new and emerging) support these communities and cities in mitigating and adapting to the effects of climate change?

– How do we best harness the potential of ICTs in adapting to the effects of climate change in rural areas, cities and communities?

– What are the guidelines, frameworks and best practices required to improve sustainability of cities and communities?

– How does circularity in city improve sustainability?

– What are the guidelines, frameworks and best practices required to apply circular economy principles into different city assets (i.e., buildings, transport, water, energy, digital and public infrastructures, waste management, and natural resource management)?

– What Recommendations, Supplements and technical reports should be developed for supporting the transition to a circular and sustainable city?

– What Recommendations, Supplements and technical reports should be developed for supporting the transition to a Net Zero city?

– How do we ensure that the current mitigation and adaptation actions are sufficient to deal with all climate variables in the long-term? How can ICTs improve current adaptation actions?

– How to mitigate and adapt the vertical sectors to climate change? What role do ICTs play in this regard?

– Explore how ICTs can be used to mitigate and adapt to the effects of climate change and biodiversity loss related to a variety of sectors, e.g., agriculture, housing, fisheries, health, and water, etc.;

– Identify best practices related to climate change mitigation and adaptation for different types of areas (e.g., agriculture, housing, fisheries, health, and water, etc.);

– Explore how to help developed and developing countries to use telecommunications/ICTs (including new and emerging) to establish climate monitoring networks, to enable rapid data gathering for emergency response, to prioritize decision making, to facilitate logistics and disaster early warning systems by sharing knowledge and data through crowd sourcing, customization of information, etc.;

#### J.3 Tasks

Tasks include, but are not limited to:

– Develop Recommendations, Supplements and/or Technical Reports that contain requirements and technical specifications on low-cost, portable, and efficient ICT solutions that can be deployed in rural areas, cities and communities for enablement;

– Establish related metrics/KPIs, measurement methods and reference values of energy efficiency requirements and evaluations for ICT solutions along with low-cost, low-impact solutions in rural areas, cities and communities;

– Develop Recommendations, Supplements and/or Technical Reports on climate change mitigation and adaptation of the vertical industries by ICT enablement to enhance climate resilience;

– Develop Recommendations, Supplements and/or Technical Reports to provide guidance for resiliency of ICT solutions in response to both natural and human-made disasters;

– Develop Recommendations, Supplements and/or Technical Reports that contain requirements, technical specifications and effective frameworks for the use and operation of telecommunications/ICTs (including new and emerging) to improve sustainability of cities and communities and apply circular economy principles in cities and communities;

– Develop Recommendations, Supplements and/or Technical Reports that provide guidance on applying circular economy principles in the following areas: buildings, transport, water, energy, digital and public infrastructures, waste management, natural resource management, and more;

– Develop metrics and key performance indicators that establish a baseline scenario for circular cities and communities;

– Maintenance and revision of existing Recommendations and Supplements.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=12/5>).

#### J.4 Relationships

WSIS Action Lines:

– C2, C6, C7

Sustainable Development Goals:

– 7, 11, 12, 13

Recommendations:

– ITU-T K-series

– ITU-T L-series

Questions:

– QA/5, QB/5, QC/5, QD/5, QE/5, QF/5, QH/5, QI/5

Study Groups:

– ITU-T SGs

– ITU-D SGs

– ITU-R SGs

Other bodies:

– ATIS

– CCSA

– CEN

– CENELEC

– ETSI EE

– ECMA

– GSMA

– 3GPP

– IEC

– IETF

– ISO

– CIAJ

– GISFI

– TSDSI

– IEEE

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1. Metaverse definition is available in deliverable from FGMV FGMV-20. [↑](#footnote-ref-1)
2. [The Global E-waste Monitor 2024](https://www.itu.int/en/ITU-D/Environment/Pages/Publications/The-Global-E-waste-Monitor-2024.aspx) [↑](#footnote-ref-2)
3. http://www3.weforum.org/docs/WEF\_A\_New\_Circular\_Vision\_for\_Electronics.pdf [↑](#footnote-ref-3)
4. <https://www.oecd-ilibrary.org/docserver/103bf23e-en.pdf?expires=1705416763&id=id&accname=guest&checksum=90F4D04251FC3E02249E1A2F6209BF3E>

   <https://www.iied.org/informal-economy-sustainable-development> [↑](#footnote-ref-4)
5. https://news.itu.int/itu-statistics-leaving-no-one-offline/ [↑](#footnote-ref-5)