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| ITU‑T Study Group 5 |
| OPERATIONAL ASPECTS OF SERVICE PROVISION AND TELECOMMUNICATION MANAGEMENT |
| Report of ITU-T SG5 to the World Telecommunication Standardization Assembly (WTSA-20), Part II: Questions proposed for study during the next study period (2022-2024) |

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| **Abstract:** | This contribution contains the text of the Study Group 5 Questions proposed for approval by the Assembly for the next study period. |
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Note by the TSB:

The report of Study Group 5 to the WTSA-20 is presented in the following documents:

Part I: **Document 1** – General

Part II: **Document 2** – Questions proposed for study during the study period 2022-2024

# 1 List of Questions proposed by Study Group 5

| **Question number** | **Question title** | **Comment** |
| --- | --- | --- |
| A/5 | Electrical protection, reliability, safety, and security of ICT systems | Continuation of Q1/5  |
| B/5 | Protecting equipment and devices against lightning and other electrical events | Continuation of Q2/5 |
| C/5 | Human exposure to electromagnetic fields (EMFs) due to digital technologies | Continuation of Q3/5 |
| D/5 | Electromagnetic compatibility (EMC) aspects in ICT environment | Continuation of Q4/5 |
| E/5 | Environmental efficiency of digital technologies | Continuation of Q6/5 |
| F/5 | E-waste, circular economy, and sustainable supply chain management | Continuation of Q7/5 |
| G/5 | Guides and terminology on environment  | Continuation of Q8/5 |
| H/5 | Climate change and assessment of digital technologies in the framework of the Sustainable Development Goals (SDGs) and the Paris Agreement | Continuation of Q9/5 |
| I/5 | Climate change mitigation and smart energy solutions | Continuation of Q11/5  |
| J/5 | Adaptation to climate change through sustainable and resilient digital technologies | Continuation of Q12/5 |
| K/5 | Building circular and sustainable cities and communities | Continuation of Q13/5 |

# 2 Wording of Questions

DRAFT QUESTION A/5

Electrical protection, reliability, safety, and security of ICT systems

(Continuation of Question 1/5)

### 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 increases much more in future society. Therefore, deficiency of some infrastructure function will cause serious social disruption. The reliability of infrastructure is essential for stability of society. Especially, the communication and information networks will act as “nerve system”, and the importance of its reliability and security grows more.

The infrastructure is composed of telecommunication network equipment, which are susceptible to damage or interference produced by external physical phenomena, such as nearby lightning strikes, disturbances in the neighbouring electric power system, electromagnetic attack, and neutrons from cosmic rays. Therefore, if not properly protected, a highly-sophisticated telecommunication system can be placed into an out of service condition by such phenomena. This Question aims to provide cost effective protective measures in order to improve the telecommunication network’s reliability as well as keeping the continuity of customer services from these events.

Specifically, lightning, attacks using extreme electromagnetic field such as High-Altitude Electromagnetic Pulse (HEMP) and High Power Electromagnetic (HPEM), and soft errors which are caused by particle radiations such as high-energy neutrons created from cosmic rays are emerging 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 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 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.124, K.125, K.130, K.131, K.134, K.138, K.139, K.142, K.146, L.75;

– Directives (except Volume VIII);

– Handbook on Earthing and Bonding;

– Handbook on Lightning;

– K-series Supplements 5, 6, 11.

### A.2 Question

The purpose of this Question is to produce new or revised Recommendations or Supplements regarding the protection of telecommunication systems against the effects of nearby lightning strikes, disturbances from nearby electric power systems.

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 and the new challenges related to the power over Ethernet (PoE) and power over data line (PoDL) as this technology evolves into outdoor environments;

– 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, such as the systems used for remote video surveillance;

– 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, considering also 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;

– 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.

### 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;

– Basic Requirements for providing information about soft errors caused by particle radiations such as high-energy neutrons created from cosmic rays or Alpha particles;

– Methodologies for the total design of ICT equipment/systems to ensure the quality and reliability of ICT equipment/systems;

– 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;

– Requirements for soft error test facilities consisting of particle accelerators used to produce neutron radiation;

– Selection of test methods, test procedures, test period and methods to monitor errors in ICT equipment subjected to testing;

– Quality and reliability estimation methods and guide for applying countermeasures resulting from soft error testing;

– Recommendations concerning semiconductor devices required for design of ICT equipment applying soft error mitigation measures;

– 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 (<http://www.itu.int/ITU-T/workprog/wp_search.aspx?sg=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

Standardization bodies

– IEC (e.g. 37A, IEC TC 47, IEC TC 77/SC77C, IEC TC 81, TC107, IEC JTC 1)

– IEEE (e.g. EMC TC5)

– CENELEC (e.g. TC 81X)

– ETSI (e.g. TC EE)

– CIGRE (e.g. JWG C4.31, C4.206 WG)

– UIC

– JEDEC

DRAFT QUESTION B/5

Protecting equipment and devices against lightning and other electrical events

(Continuation 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. If the network items do not have sufficient withstand resistibly to the coupled surge conditions, these surge events may cause interruption of information transfer, equipment damage or hazardous conditions. ICT systems should be designed to recover after transmission interruptions, damaged items may impair system performance and failed items need repair or replacement, which interrupts operation and creates e-waste.

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.126, K.128, K.129, K.135, K.140, K.143, K.144, K.147; K.148

– K-series Supplements 3; 7, 8, 12, 15, 17, 18;21; 22; 23; 24; 25;

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

– Directives, Volume VIII.

### B.2 Question

The purpose of this Question is to produce new or revised Recommendations or Supplements regarding the resistibility Recommendations for ICT equipment and also specifications, test methods and principles of application for protective components and assemblies. The resistibility Recommendations against overvoltages and overcurrents 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;

– 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 61000-4-6;

– 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 communication;

– 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.

### 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 (<http://www.itu.int/ITU-T/workprog/wp_search.aspx?sg=5>).

### B.4 Relationships

WSIS Action Lines:

– C2, C5

Sustainable Development Goals:

– 7, 9

Recommendations:

– 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.126, K.128, K.129, K.135, K.140, K.147; K.148

Questions:

– QA/5, QD/5

Study Groups:

– ITU-T SGs

– ITU-R SGs

– ITU-D SGs

Standardization bodies:

– IEC (TC 109, TC 108, TC 81, TC 64, TC 37, SC 77B, SC 37A and SC 37B)

– ISO

– Broadband Forum

– CENELEC

– IEEE-PES-SPDC

– ATIS (STEP)

– UL

– ETSI

DRAFT QUESTION C/5

Human exposure to electromagnetic fields (EMFs) due to digital technologies

(Continuation of Question 3/5)

### C.1 Motivation

Information and communication technologies (ICTs) and digital technologies 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 ICTs and digital technologies comply with human exposure guidelines and limits recommended by the World Health Organization (WHO).

This Question will develop standards (ITU-T Recommendations) and guidelines for the protection of people exposed to EMF emitted by ICTs and digital technologies 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.

Taking into consideration the need to assess the levels of EMFs to which employees may be exposed to EMF, this Question will develop standards, 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;

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

### C.2 Question

The purpose of this Question is to develop international standards (ITU-T Recommendations) and guidelines 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 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 digital technologies including, but not limited to, telecommunication systems, 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, multi-band 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 numerical modelling of the electromagnetic fields in the areas around telecommunication transmitting antennas: accuracy, uncertainty, reflections, influence of the human body etc.;

– Guidance on the field levels that occur around transmitting antennas used for various telecommunication systems;

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

– Work concerning guidance on the selection of spatial 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 service;

– EMF exposure assessment and compliance of digital technologies, including IoT and 5G, and future evolutions such as 6G systems.

– Consideration of the exposure from non-radiocommunication EMF sources in case that may be considered as ambient sources and should be included in 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 digital technologies 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 human exposure guidelines and limits to be published as a monograph in the Environmental Health Criteria Series;

– 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 technologies including IoT, 5G and future evolutions such as 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 and K.145;

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

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<http://itu.int/ITU-T/workprog/wp_search.aspx?sg=5>).

### C.4 Relationships

WSIS Action Lines:

– [C2, C5](file://C:\Users\ubeda\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\M79BDJPV\Action%20line%202%20)

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 [Question ITU-R 239/1](https://www.itu.int/pub/R-QUE-SG01.239)

– ITU-D SGs

Standardization bodies:

– WHO

– IEC TC 106

– ICNIRP

– IEEE ICES

– CENELEC TC 106X

DRAFT QUESTION D/5

Electromagnetic compatibility (EMC) aspects in ICT environment

(Continuation of Question 4/5)

### D.1 Motivation

The electromagnetic environment is changing rapidly through the development and installation of new types of electric/electronic equipment and evolving the telecommunication infrastructure. Examples include deployment of products with higher clock frequencies, deployment of new radio systems and use of wireless power transmission (WPT) systems with high power radio frequency current which changes the electromagnetic environment. Focus will be also addressed to electromagnetic aspects for the green growth deployment of ICT.

On the other hand, the philosophy of EMC standard specified the protection of radio services used in close environments instead in the future it needs to address the deployment of high density of radio devices in the same environment and this will increase the mutual-interference and intermodulation cases.

Aspect impacting the electromagnetic environment in telecommunication applications are:

– The use of switching power converters that is becoming more popular by the deployment of photovoltaic systems and wind turbines for utilization of natural energies. The switching power converter is installed in the electric systems such as air conditioners, power supply for ICT equipment, and LED lightings for power saving, 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 networks, for example:

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

• The use of wireless Access technologies (Wi-MAX, UWB, NFC, LTE, 5G 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.

Furthermore, wearable devices and wireless systems will be used in vicinity of ICT 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 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 ICT equipment are studied and published by IEC CISPR and TC77. However, the requirements cannot be directly applied for all ICT 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 ICT equipment are essential in ITU-T for keeping quality and reliability of ICT systems and services.

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

It is also important to define requirements for electric and electronic apparatuses used in ICT facilities to maintain a suitable electromagnetic environment for ICT 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.43, K.48, K.49, K.58, K.59, K.60, K.62, K.63, K.74, K.76, K.79, K.80, K.85, K.86, K.88, K.92, K.93, K.94, K.106, K.114, K.116, K.123, K.127, K.132, K.133, K.136, K.137, K.141; K.149;

– K.Supplement 10; 26;

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

### D.2 Question

The purpose of this Question is to produce new or revised Recommendations or Supplements regarding EMC (emission and immunity) requirements for ICT installations and equipment - including both the wireless and wireline equipment, and electric and electronic equipment installed in telecommunication 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 leakage and impact of radio frequency noise from telecommunication systems using metallic conductors;

– Estimation of interferences from wireless power transmission (WPT) systems to telecommunication systems;

– New Recommendation on EMC requirements for WPT systems;

– Estimation of interferences from grid connected power converter (GCPC) used in photovoltaic systems etc.;

– Development of EMC requirements for GCPC systems;

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

– Evaluation of interferences from telecommunication 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 telecommunication equipment;

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

– Development of Recommendations on electromagnetic environment related to body worn wireless equipment and radio devices attached to apparatuses;

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

– EMC specifications taking into account 5G technologies;

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

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

– Maintenance and enhancement of existing Recommendations and new Supplements on electromagnetic environment and requirements for EMC.

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme (<http://itu.int/ITU-T/workprog/wp_search.aspx?sg=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

Standardization bodies:

– IEC CISPR

– IEC TC 77, IEC TC 69

– ETSI ERM EMC WG

– CENELEC TC210, TC215 WG2

– IEEE EMC society

– 3GPP RAN4

DRAFT QUESTION E/5

Environmental efficiency of digital technologies

(Continuation of Question 6/5)

### E.1 Motivation

Artificial intelligence, blockchain, 5G, the Internet of Things (IoT), autonomous vehicles, robotics, virtual and augmented reality, digital twins, along with other digital and frontier technologies brought on by the Fourth Industrial Revolution are transforming the way in which the current production systems operate. These technologies are capable of unlocking the next level of efficiency for the public and manufacturing sector while accelerating progress on the Sustainable Development Goals (SDGs).

However, the environmental performance of digital and frontier technologies themselves is often overlooked. Digital technologies utilize ICT equipment and installation to communicate with one another. Routers, servers, switches are needed to enable high speed, large-scale broadband services, and computational activities. Additional radio base stations and data centres are also needed to power the next generation wireless networks and other IoT applications. These equipment and installations consume a huge amount of energy to operate, which contribute significantly to global carbon emissions.

This Question identifies the environmental efficiency requirements of digital and frontier technologies, including their water, materials, and energy efficiency. It focuses on studying technical solutions, enhancements, metrics, key performance indicators and related accurate measurement methods and reference values for different type of technologies.

This Question is also in line with the following 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.1300, L.1301, L.1302, L.1303, L.1310, L.1315, L.1316, L.1317, L.1320, L.1321, L.1330, L.1331, L.1330, L.1331, L.1332, L.1340, L.1350, L.1351,

– L-series Supplements 1, 6, 7, 8, 9, 10, 11, 12, 33, 36, 41, 42, 43 and 44;

– Technical Paper on Study on methods and metrics to evaluate energy efficiency for future 5G systems.

### E.2 Question

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

– Study areas and related Recommendations dealing with energy consumption and environmental efficiency;

– Develop Metrics/KPIs related to the material, water and energy efficiency of ICT networks and digital technologies;

– Metrics/KPIs, related measurement methods and reference values to be developed, power/cooling systems, renewable energy use and interconnection in smart grids, etc.;

– Technical specifications and best practices for energy consumption/efficiency of digital and frontier technologies and related components (e.g., the next generation telecommunication networks, data centre infrastructures, radio sites etc.);

– Energy efficiency control and monitoring solutions for ICT networks and digital technologies;

– Define energy efficiency metrics, measurements, and solutions for digital technologies;

– Define efficient architectures and facility solutions for digital technologies (e.g., AI, IoT, 5G/IMT-2020) network implementation taking into consideration the efficient use of energy and resources;

– Identify environmentally efficient technologies and solutions for ICT and digital technologies (including 5G/IMT-2020, big data, artificial intelligence, blockchain, etc.) and other industries;

– Evaluate the environmental performance and study the requirements for energy efficiency of 5G networks;

– Study and promote the integration and reuse of existing network elements (even if they are of a previous generation) in order to be compatible with the latest digital technologies.

### E.3 Tasks

Tasks include, but are not limited to:

– Develop Recommendations and Supplements on material, water and energy efficiency metrics, measurements and solutions for ICT networks and digital technologies;

– Develop Recommendations and Supplements on material, water and energy efficiency metrics, measurements and solutions for new radio mobile access and the related supporting networks;

– Develop Recommendations and Supplements on the sustainable use of ICT networks and digital technologies (including 5G/IMT-2020, big data, artificial intelligence, blockchain, etc.);

– Develop best practices, use cases on items related to water, material and energy efficiency of ICT networks and digital technologies;

– Develop Recommendations on water, material, and energy efficient solutions for spread ICT network implementation in order to improve the efficient use of energy and resources including IoT and 5G/IMT-2020 networks;

– Develop Recommendations, Supplements and Technical Reports on water, material and energy efficiency control and monitoring solutions for ICT networks and digital technologies;

– Develop Recommendations, Supplements and Technical Reports on energy efficiency of 5G networks;

– Develop Recommendations, Supplements and Technical Reports on the integration and reuse of existing network elements (even if they are of a previous generation) in order to be compatible with the latest digital technologies;

– 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 (<http://itu.int/ITU-T/workprog/wp_search.aspx?sg=5>).

### E.4 Relationships

WSIS Action Lines:

– C2, C7

Sustainable Development Goals:

– 7, 11, 13

Recommendations:

– ITU-T K-series

– ITU-T L-series

Questions:

– QF/5, QH/5, QI/5, QJ/5, QK/5

Study Groups:

– ITU-T SGs

– ITU-D SGs

– ITU-R SGs

Standardization bodies:

– ATIS

– CCSA

– ETSI

– ECMA

– IEC

– IETF

– ISO

– CIAJ

– GISFI

– 3GPP

– TSDSI

– IEEE

– CESI

DRAFT QUESTION F/5

E-waste, circular economy, and sustainable supply chain management

(Continuation of Question 7/5)

### F.1 Motivation

Digital technologies are at the centre of a new economic model that is based on a knowledge and information society. Mobile phones, tablets, 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 to a wide-range of digital technologies, 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, cell 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. Over 50 million tonnes of e-waste were recorded in 2018 and only about 20% of this e-waste is managed in an environmentally sound manner[[1]](#footnote-1). Improperly disposing e-waste poses serious risks to both the environment and human health.

This Question seeks to address the e-waste challenge by identifying the environmental requirements of digital technologies including IoT, end-user equipment and ICT infrastructures or installations, based on the circular economy principles and improving the supply chain management.

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

Since supply chain management involves the management of the entire lifecycle process of goods or services, from the selection of raw materials, design principles to the final product, supply chain management plays a critical role in improving the environmental performance of digital 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 of 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).

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 programs 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.

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 reuse.

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.1020, L.1021, L.1022, L.1023, L.1030, L.1031, L.1032, L.1033, L.1060, L.1100, L.1101, L.1102;

– 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 Question

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

– How to ensure the safety and environmental performance of digital technologies, ICT products, equipment, and facilities, including the avoidance of virgin and hazardous materials and final disposal through standards?

– How to ensure that digital technologies, ICT products, equipment and facilities cause minimum environmental and health impact on the entire life cycle including production and use of materials?

– 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 framework required to develop EEE 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, reuse, recycle and recover) into e-waste management with a special focus on developing countries?

– How to implement the circular economy principles (reduce, reuse, recycle and recover) to achieve a sustainable supply chain?

– How to implement the circular economy principles in product design phases?

– 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 programs (such as eco-labels) that would encourage users to take responsible purchasing decisions?

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

– How to provide guideline to involved stakeholder on give a correct information on e-waste management effect and opportunities?

### F.3 Tasks

Tasks include, but are not limited to:

– Develop Recommendations and/or Supplements and 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 ITU-T Study Group 5 to identify the 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 in digital technologies organizations and achieve a circular economy;

– Develop Supplements and/or Technical Reports which provide effective guidelines on e-waste management for different 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 digital technologies could contribute to a circular economy;

– Develop Recommendations, Supplements and 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 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 KPI/metrics related to circular economy application at digital technologies;

– Develop Recommendations, Supplements and/or Technical Reports on key eco-rating programs 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 digital technologies 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;

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

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

– 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 (<http://itu.int/ITU-T/workprog/wp_search.aspx?sg=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, QK/5

Study Groups:

– ITU-T SGs

– ITU-D SGs

– ITU-R SGs

Standardization 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

\* Counterfeit ICT devices include counterfeit and/or copied devices and equipment as well as accessories and components.

DRAFT QUESTION G/5

Guides and terminology on environment

(Continuation of Question 8/5)

### G.1 Motivation

Study Group 5 has in force over 200 Recommendations and near 50 Supplements. To be useful to stakeholders, guidance is needed to locate a specific topic of interest and the terminology used should harmonise within Study Group 5 and with what is used in other international standards development organisations.

SG5 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 maintain updated this Guide.

ITU-T Study Group 5 covers also Information and Communications Technologies (ICT), digital technologies, EMC, EMF, Environment and Climate Change (CC) to reach Sustainable Development Goals.

ITU-T Study Group 5 has published several Recommendations and other deliverables which have 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 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 Recommendation L series: Environment and ICTs, climate change, e-waste, energy efficiency;

– Guide to the use of ITU-T Publications produced by 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 Question

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 parties outside of ITU-T Study Group 5;

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

### 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 1.1.2;

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

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

– Enhancement of the Study Group 5 publications;

– Develop and maintain Guides to 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 Study Group 5 web presence;

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

An up-to-date status of work under this Question is contained in the ITU-T SG5 work programme ([http://itu.int/ITU-T/workprog/wp\_search.aspx?sg=5](http://www.itu.int/ITU-T/workprog/wp_search.aspx?sg=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 Study Group 5

Questions:

– All SG5 Questions

Study Groups:

– ITU-T SGs

– ITU-R SGs

– ITU-D SGs

Vocabulary:

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

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

– ITU Terms and Definitions <https://www.itu.int/net/ITU-R/index.asp?redirect=true&category=information&rlink=terminology-database&lang=en&adsearch=&SearchTerminology=&collection=&sector=&language=all&part=abbreviationterm&kind=anywhere&StartRecord=1&NumberRecords=50>

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

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

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

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

Standardization bodies:

– IEC

– ISO

– IEEE-SA

– ETSI

– Other relevant standardization bodies

DRAFT QUESTION H/5

Climate change and assessment of digital technologies in the framework of the Sustainable Development Goals (SDGs) and the Paris Agreement

(Continuation of Question 9/5)

### 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 digital technologies, including information and communication technologies (ICTs), artificial intelligence, 5G, etc., 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, Question H/5 intends to particularly focus on these two topics as well.

The ICT sector has the responsibility to limit its own life-cycle 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, which 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.

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-series Supplements 2, 3, 13, 26, 34,37 and 38.

### H.2 Question

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

– Examine how to assess the sustainability impacts of digital technologies, including 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

– Examine how to assess the sustainability benefits offered by ICT resilience services (teleworking, telemedicine, early warning systems) in the context of sanitary and other crises;

– Develop Recommendations and guidelines in the frame of Sustainable Development Goals (SDGs) and the Paris Agreement to support climate change adaptation and mitigation actions, reach IPBES Biodiversity objectives, etc., stay within the planetary boundaries[[2]](#footnote-2);

– Develop and update GHG emissions trajectories for at least 2025, 2030 and 2050 for the ICT sector, sub-sectors and organisations 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,

– 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 stakeholder;

– 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 organisations, 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 2025, 2030 and 2050 for the ICT sector, sub-sectors and organisations and provide targets guidance.

– Develop Recommendations on the methodologies to assess the positive environmental effects of digital technologies (including ICTs, AI, etc) 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 environmental impacts of digital technologies at country/sector level in line with the adoption of the UNFCCC Paris agreement;

– 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 sustainability impacts of digital technologies at different levels(country, city, communities, industry, etc), taking into account the Sustainable Development Goals (Paris Agreement, etc.) as applicable;

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

– Develop Recommendations, Supplements and/or Technical Reports on a fact base regarding ICT in the frame of TCFD, regional taxonomies and similar initiatives from international organisations, 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.

– 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 (<http://itu.int/ITU-T/workprog/wp_search.aspx?sg=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, QK/5,

Study Groups:

– ITU-T SGs 9, 13, 15, 16 and 20

– ITU-D

– ITU-R

Standardization bodies and other organizations:

– ISO

– IEC

– ETSI

– UNFCCC

– IPCC

– UNIDO

– UNECE

– UNEP

– WEF

– WBCSD

– WRI

– ULE

– CDP

– WMO

– ICC

– IEA

– GeSi

– SBTi

– IPBES

– UICN

– FutureEarth

– Business for Nature

DRAFT QUESTION I/5

Climate change mitigation and smart energy solutions

(Continuation 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 system using ICT and digital technologies such as artificial intelligence.

Driven by a robust global economy and strong heating and cooling needs, global energy demand continues to grow. The growing demands for fossil fuel and natural gas are outpacing the record gain in renewables, including solar and wind generation. As a result, global energy-related emissions increased by 1.7% in 2018 and is expected to continue to grow[[3]](#footnote-3).

At the heart of climate change mitigation is to reduce carbon emissions. Information communication technologies (ICTs) and digital technologies are the key enabler for creating a sustainable, efficient, cost effective and intelligent smart energy system. Smart energy system connects energy supply and demands through intelligent networking. ICTs such as smart grids and meters monitors the optimal usage of energy, balancing supply and demand based on real-time information collected by different IoT applications. A smart energy system not only reduce energy demand but also increase renewable energy uptake so it will be possible to achieve a high impact on climate change mitigation.

In the view above, this Question seeks to develop standards, guidelines and measurement frameworks that support the development of a smart energy system and applying smart energy solutions to achieve a low-carbon economy.

This Question aims to develop Recommendations, Supplements and/or Technical reports on real time energy service and control solutions for more effective and efficient energy management trough ICT and digital technologies.

This Question will develop standards, frameworks, and requirements for promoting energy efficiency and will facilitate energy management improvements for CO2 emissions reduction.

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.1305, L.1360, L.1361, L.1362, L.1370, L.1371, L.1380, L.1381, L.1382, L.1383

– L series Supplement 44

### I.2 Question

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

– What Recommendations, Supplements or technical reports are needed to deal with climate change mitigation and smart energy systems?

– What are the requirements for smart energy solutions able to mitigate climate change?

– What are the requirements for the application of smart energy solutions in ICT installations (e.g., data centres, IoT, M2M, radio sites, customer sites, etc.)?

– What Recommendations are needed to reduce CO2 emission according to UNFCCC the Paris Agreement and simultaneously incentivize the reduction of energy consumption with rewarding referring to the technological solutions and systems?

– What Recommendations, Supplements or technical reports are needed for most efficient solutions related to ICT sector infrastructures and facilities, including ICT equipment, power systems, cooling systems and management systems?

– 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?

– What Recommendations, Supplements or technical reports are needed to define efficient architectures and facility solutions for digital technologies (e.g., AI, IoT, 5G/IMT-2020) network implementation taking into consideration the efficient use of energy and resources?

– 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 supply chain?

### I.3 Tasks

Tasks include, but are not limited to:

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

– Develop Recommendations, Supplements and/or Technical Reports to set the requirements for mitigating climate change using digital technologies;

– Develop Recommendations, Supplements and/or Technical Reports on utilizing ICT sites as a micro-grid (e.g., using IoT technology);

– 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 or smart energy solutions;

– Develop Recommendations, Supplements and/or Technical Reports on smart energy technologies and solutions for digital technologies (including data centre, 5G, big data, artificial intelligence, blockchain, etc.) and other industries;

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

– Develop Recommendations, Guidelines and Supplements concerning the implementation of reduction of CO2 emission with reference to UNFCCC Paris Agreement, including to incentivize the reduction of energy consumption with rewarding mechanisms referring to the technological solutions and systems;

– Develop Recommendations Supplements and/or Technical Reports on control/monitoring/management of power cooling, facilities infrastructure management and remote power metering of digital technologies equipment;

– Develop Recommendations Supplements and/or Technical Reports on new energy saving solutions and low carbon emission solutions, including key parameter requirements of digital technologies equipment, network and realization including Data Centres;

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

– 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 (<http://www.itu.int/ITU-T/workprog/wp_search.aspx?sg=5>).

### I.4 Relationships

WSIS Action Lines:

– C2, C7

Sustainable Development Goals:

– [7, 11, 13](file:///C%3A%5CUsers%5Cubeda%5CAppData%5CLocal%5CMicrosoft%5CWindows%5CINetCache%5CContent.Outlook%5CM79BDJPV%5CSDG%207%20)

Recommendations:

– ITU-T K-series

– ITU-T L-series

Questions:

– QE/5, QF/5, QH/5,QJ/5, QK/5

Study Groups:

– ITU-T SGs

– ITU-D SGs

– ITU-R SGs

Standardization bodies:

– ATIS

– CCSA

– ETSI

– ECMA

– IEC

– IETF

– ISO

– CIAJ

– GISFI

– 3GPP

– TSDSI

– IEEE

– CESI

DRAFT QUESTION J/5

Adaptation to climate change through sustainable
and resilient digital technologies

(Continuation of Question 12/5)

### J.1 Motivation

Digital technologies can be effective in enabling countries and cities to better adapt to climate change. Adaptation involves taking action to tolerate the effects of climate change on a local, 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.

Digital technologies, 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 digital technologies are essential for saving lives and should be provided where needed including developing countries.

ICTs can also play a crucial role in supporting cities to adapt to the effects of climate change. Remoting 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 and communities. 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 digital technologies in adapting to the effects of climate change. While half of the world population is now connected to the internet, the other half remains offline[[4]](#footnote-4). 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.

This Question would improve the efficiency of power and cooling systems in ICT networks, support the development of energy efficiency ICT architectures such as up to 400 VDC power feeding systems, add energy saving features to ICTs equipment and applications, improve air flow controlling technology, cooling technology and renewable energy systems and more. All these features can improve energy efficiency and reduce carbon emissions of digital technologies.

In addition, the lack of adequate broadband infrastructure is also limiting the adoption of ICTs in rural areas. Low-cost, portable and energy efficient powering units and broadband infrastructures can accelerate the adoption of ICTs and thereby enhancing their adaptation measures.

Question J/5 aims to develop Recommendations, supplements and/or Technical reports that support the deployment of digital technologies in accelerating climate adaptation actions. Particular emphasis has been placed on expanding the capacity of rural communities and areas to build and maintain climate resilient ICT infrastructures.

Additionally, to be effective in this role, the telecommunications infrastructure and associated ICT must be resilient to the effects of climate change. The ICT sector itself must therefore be taken into consideration when considering adaptation to climate change.

The ICT sector can help adapt to the adverse impacts of climate change with, for instance, but not limited to, early warning systems, smart agriculture applications, micro smart grids, building optimization.

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

Digital technologies 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” 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.1200, L.1201, L.1202, L.1203, L.1204, L.1205, L.1206, L.1207, L.1210, L.1220, L.1221, L.1222, L.1325, 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.

### J.2 Questions

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

– What are the most efficient and resilient solutions related to ICT sector infrastructures and facilities, including ICT equipment, power systems, cooling systems and management systems?

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

– How can digital technologies support these communities in 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?

– Which ICT infrastructures are key for adapting to climate change in rural areas, cities, and communities?

– How to increase broadband coverage while providing low-cost and efficient ICT equipment and infrastructures in those areas?

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

– How to adapt the agriculture sector to climate change? What role do ICTs play in this regard? Can we make the agriculture sector climate-proof?

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

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

– Explore how to help developed and developing countries to use digital technologies 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.;

– Examine how to use ICTs for monitoring the displacement and settlement of populations in different areas such as like coastal zones, marine ecosystems, urban and rural areas;

– Most efficient solutions related to ICT sector infrastructures and facilities, including ICT equipment, power systems, cooling systems and management systems related to low-cost solutions;

– 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 related to low-cost solutions;

– Improve and complement safety criteria and requirements for service personnel and equipment;

– Define efficient architectures and facility solutions for digital technologies (e.g., AI, IoT, 5G/IMT-2020) network implementation taking into consideration the efficient use of energy and resources related to low-cost solutions.

### 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 infrastructure that can be deployed in rural areas and communities;

– Develop Recommendations, Supplements and/or Technical Reports that examine the long-term impacts of climate change in rural areas, cities, and communities;

– Establish related metrics/KPIs, measurement methods and reference values of energy efficiency requirements and evaluations for new solutions along with low-cost low impact solutions;

– Develop Recommendations, Supplements and/or Technical Reports on climate change adaptation of the ICT Sector by enhancing infrastructure/facilities resilience to climate related hazards;

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

– Develop Recommendations Supplements and/or Technical Reports on control/monitoring/management of power cooling, facilities infrastructure management and remote power metering of digital technologies equipment related to low-cost solutions;

– Develop Recommendations Supplements and/or Technical Reports on new energy saving solutions and low carbon emission solutions, including key parameter requirements of digital technologies equipment, network and realization including Data Centres for low-cost solutions;

;

– 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 (<http://www.itu.int/ITU-T/workprog/wp_search.aspx?sg=5>).

### J.4 Relationships

WSIS Action Lines:

– C2, C7

Sustainable Development Goals:

– 7, 11, 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, QK/5

Study Groups:

– ITU-T SGs

– ITU-D SGs

– ITU-R SGs

Standardization bodies:

– ATIS

– CCSA

– ETSI EE

– ECMA

– GSMA

– 3GPP

– CCSA

– IEC

– IETF

– ISO

– CIAJ

– GISFI

– 3GPP

– TSDSI

– IEEE

DRAFT QUESTION K/5

Building circular and sustainable cities and communities

(Continuation of Q13/5)

### K.1 Motivation

Until now, the circular economy concept has primarily been applied only to the economic sphere. Yet, the circular economy principles hold great potential in improving sustainability in cities and communities. Sharing, recycling, refurnishing, reusing, replacing, and digitizing are identified as some of the circular actions that can be applied to a wide-range of city assets. In addition, any practices that enables more sustainable environmental style 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 consume in a city.

By embedding circular and sustainable actions into different city assets, city leaders will be able to unlock 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, fewer material is needed to produce the same products with less waste being generated.

Digital technologies play a crucial role in the transition to a circular 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.

In view of the above, Question K/5 aims to develop Recommendations, Supplements and/or Technical Reports identifying requirements and providing guidance, innovative frameworks and tools that support the transition to a circular city.

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”; SDG 12 “Ensure sustainable consumption and production patterns” and SDG 13 “Take urgent action to combat climate change and its impact”.

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

### K.2 Question

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

– What are the guidelines, frameworks and best practices require 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, natural resource management etc.)?

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

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

### K.3 Tasks

Tasks include, but are not limited to:

– Develop Recommendations, Supplements and/or Technical Reports that contain requirements, technical specifications, and effective frameworks to improve sustainability of cities and communities;

– Develop Recommendations, Supplements and/or Technical Reports that contain requirements, technical specifications and effective frameworks for the use and operation of digital technologies (i.e., AI, 5G, etc.) in cities and communities;

– Develop Recommendations, Supplements and/or Technical Reports that contain requirements, technical specifications, and effective frameworks for applying 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 baseline scenario of a circular cities and communities.

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

### K.4 Relationships

WSIS Action Lines:

– C2, C6, C7

Sustainable Development Goals:

– 11, 12, 13

Recommendations:

– ITU-T K-series

– ITU-T L-series

– ITU-T Y-series

Questions:

– QE/5, QF/5, QH/5, QI/5, QJ/5

Study Groups:

– ITU-T SGs

– ITU-D SGs

– ITU-R SGs

Standardization bodies:

– CEN

– CENELEC

– ETSI

– IEC

– ISO

– IEEE

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1. <http://www3.weforum.org/docs/WEF_A_New_Circular_Vision_for_Electronics.pdf> [↑](#footnote-ref-1)
2. Planetary boundaries refer to global boundaries of nine processes that regulates the Earth systems stability and resilience. These boundaries consider stratospheric ozone depletion, loss of biosphere integrity (biodiversity loss and extinctions, chemical pollution and the release of novel entities, climate change, ocean acidification, freshwater consumption and the global hydrological cycle, land system change, nitrogen and phosphorous flows to the biosphere and oceans and atmospheric aerosol loading. [↑](#footnote-ref-2)
3. <https://www.iea.org/newsroom/news/2019/march/global-energy-demand-rose-by-23-in-2018-its-fastest-pace-in-the-last-decade.html> [↑](#footnote-ref-3)
4. <https://news.itu.int/itu-statistics-leaving-no-one-offline/> [↑](#footnote-ref-4)