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International Telecommunication Union
Standardization Sector

Recommendation

ITU-T L.1481 (12/2022)

SERIES L: Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant

Assessment methodologies of ICTs and CO2 trajectories

Guidance on how to address the Connect 2030 targets on net greenhouse gas abatement

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Recommendation ITU-T L.1481

Guidance on how to address the Connect 2030 target on net greenhouse gas abatement

Summary

Recommendation ITU-T L.1481 provides guidelines on how to address the Connect 2030 target on net telecommunication/ICT-enabled greenhouse gas (GHG) abatement. It is intended to be utilized by relevant stakeholders of the Connect 2030 ambitions, while considering the sustainable development goal (SDG) 13 and the objectives of the Paris Agreement and the Glasgow Climate Pact.

It also presents examples of information and communication technology (ICT) solutions associated with a potential reduction of GHG emissions in other sectors.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Keywords

Connect 2030, GHG emissions, Glasgow Climate Pact, ICT sector, Paris agreement, SDG 13 goal.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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Introduction

The United Nations Framework Convention on Climate Change (UNFCCC), entered into force in 1994, with the ultimate objective to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system. Since then, the Parties to the Convention have been negotiating protocols and agreements in order to set objectives and implement actions aimed at reaching the Convention's objective.

The UNFCCC provides access to data on national greenhouse gas (GHG) emissions and removals, both by countries that are Parties to the Climate Change Convention, and by various organizations that also collect, estimate and/or disseminate data on GHG emissions/removals.

The Paris Agreement [b-UNFCCC PA], which entered into force on November 4, 2016, agreed to work to keep a global temperature rise in 2100 well below 2°C, or preferably below 1.5°C, compared to preindustrial levels. In 2021, the Paris Agreement was complemented by the Glasgow Climate Pact, aiming to turn the 2020s into a decade of climate action and support [b-UNFCCC GCP].

Moreover, the United Nations adopted, in September 2015, the 2030 Agenda for Sustainable Development, which came into force in January 2016. This Agenda is composed of 17 sustainable development goals (SDGs) with their corresponding targets.

Particularly, SDG 13 aims to take urgent action to combat climate change and its impacts and UN calls for action by using a wide array of technological measures and changes in behaviour, to limit the increase in global mean temperature in line with the Paris Agreement.

In 2018, the ITU Plenipotentiary Conference met in Dubai and agreed on (PP-18 Resolution 200, Rev. Dubai, 2018) and the ITU's Connect 2030 Agenda which is linked to the Strategic Plan of the Union for the period 2020-2023, ensuring that technology serves humanity and the planet.

More specifically, ITU has defined Connect 2030 target 3.4 as follows: "*By 2023, net telecommunication/ICT-enabled Greenhouse Gas abatement should have increased by 30% compared to the 2015 baseline"*. Such effects are referred to as second order effects in [ITU-T L.1410].

ITU-T SG5 has developed several Recommendations tackling second order aspects such as [ITU-T L.1410] "Methodology for environmental life cycle assessments of information and communication technology goods, networks and services", [ITU-T L.1430] "Methodology for assessment of the environmental impact of information and communication technology greenhouse gas and energy projects", [ITU-T L.1440] "Methodology for environmental impact assessment of information and communication technologies at city level", and [ITU-T L.1451] "Methodology for assessing the aggregated positive sector-level impacts of ICT in other sectors", as well [ITU-T L.1480] "Enabling the Net Zero transition: Assessing how the use of ICT solutions impacts GHG emissions of other sectors". However, the scope of Connect 2030 is different and the present Recommendation aims to complement those by providing guidance on how to address target 3.4, which deals with aggregated second order effects.

It is noted that deriving the net telecommunication GHG abatement compared to a 2015 baseline may not be feasible, since the data availability is low and especially as such baseline is lacking. There are also methodological challenges. Acknowledging this situation, the present Recommendation aims to propose a way forward towards a deeper understanding of ICT´s second order effects.

Recommendation ITU-T L.1481

Guidance on how to address the Connect 2030 target on net greenhouse gas abatement

1 Scope

This Recommendation provides guidelines on how to address the Connect 2030 sustainability target 3.4, which states: "By 2023, net telecommunication/ICT-enabled greenhouse gas abatement should have increased by 30% compared to the 2015 baseline". Such effects are referred to as second order effects in [ITU-T L.1410] and [ITU-T L.1480].

This Recommendation aims to complement [ITU-T L.1410] and [ITU-T L.1480] by providing guidance on how to address target 3.4, which deals with aggregated second order effects.

Hence, this Recommendation aims to propose a way forward towards a deeper understanding of how to increase and quantify ICT's second order effects.

This Recommendation is intended to be utilized by relevant stakeholders to address the Connect 2030 ambitions, while considering the SDG 13 goal and the objectives of the Paris Agreement.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T L.1410] Recommendation ITU-T L.1410 (2014), *Methodology for environmental life cycle assessments of information and communication technology goods, networks and services*.

[ITU-T L.1430] Recommendation ITU-T L.1430 (2013), *Methodology for assessment of the environmental impact of information and communication technology greenhouse gas and energy projects*.

[ITU-T L.1440] Recommendation ITU-T L.1440 (2015), *Methodology for environmental impact assessment of information and communication technologies at city level.*

[ITU-T L.1450] Recommendation ITU-T L.1450 (2018), *Methodologies for the assessment of the environmental impact of the information and communication technology sector*.

[ITU-T L.1451] Recommendation ITU-T L.1451 (2018), *Methodology for assessing the aggregated positive sector-level impacts of ICT in other sectors*.

[ITU-T L.1470] Recommendation ITU-T L.1470 (2020), *Greenhouse gas emissions trajectories for the information and communication technology sector compatible with the UNFCCC Paris Agreement.*

[ITU-T L.1480] Recommendation ITU-T L.1480 (2022), *Enabling the Net Zero transition: Assessing how the use of information and communication technology solutions impact greenhouse gas emissions of other sectors.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 first order effect [ITU-T L.1480]: Direct environmental effect associated with the physical existence of an ICT solution, i.e., the raw materials acquisition, production, use and end of life treatment stages, and generic processes supporting those including the use of energy and transportation.

NOTE 1 – First order effects include GHG and other emissions, e-waste, use of hazardous substances and use of scarce, non-renewable resources.

NOTE 2 – First order effects are sometimes referred to as environmental footprints.

3.1.2 higher order effect [ITU-T L.1480]: The indirect effect (including but not limited to rebound effects) other than first and second order effects occurring through changes in consumption patterns, lifestyles and value systems.

NOTE 1 – Rebound effects includes such as financial gains, savings in time and space and others.

NOTE 2 – Higher order effects could be associated with both second and first order effects.

NOTE 3 – This emerges from [ITU-T L.1480] and was amended from [ITU-T L.1410] where it is referred to as other effects, and is also referred to as third order effects in some academic literature.

3.1.3 second order effect [ITU-T L.1480]: The indirect impact created by the use and application of ICT which includes changes of environmental load due to the use of ICT that could be positive or negative.

NOTE – Second order effects can be either actual or potential.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

GHG Greenhouse Gas

ICT Information and Communication Technology

SDG Sustainable Development Goal

5 Conventions

In this Recommendation:

The expressions "is required" and "shall" indicate a requirement which must be strictly followed and from which no deviation is permitted if *full compliance* to this Recommendation is to be claimed.

The expressions "is recommended" and "should" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim compliance with this Recommendation.

The expressions "can optionally" and "may" indicates an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with this Recommendation.

In all cases, the fundamental lifecycle assessment (LCA) principles of *relevance, completeness, consistency, accuracy and transparency* shall guide the practitioner.

6 Principles

The following principles shall be taken into consideration when estimating the lifecycle greenhouse gas (GHG) emissions of the information and communication technology (ICT) sector:

– **relevance**: Select data and methods appropriate to the assessment.

– **completeness**: Include all elements that provide a material contribution to the overall results.

– **consistency**: Enable meaningful analysis regarding the development of results over time by using the same method and data sources.

– **accuracy**: Reduce bias and uncertainties as much as practicable.

– **transparency**: When communicating results, organizations shall give sufficient information to support the interpretation of the results. This means that data sources, data collection process as well as the modelling and the assumptions made must be clearly stated and motivated in the documentation, as well as all the boundaries and cut-offs.

– **conservativeness**: Conservative assumptions and values shall be used when there are uncertainties. Conservative quantification results will be underestimated rather than overestimated.

7 Challenges in quantifying the net ICT GHG second order effect compared to a baseline

ITU-T has developed several Recommendations tackling second order aspects such as

– [ITU-T L.1410] "Methodology for environmental life cycle assessments of information and communication technology goods, networks and services"

– [ITU-T L.1430] "Methodology for assessment of the environmental impact of information and communication technology greenhouse gas and energy projects"

– [ITU-T L.1440] "Methodology for environmental impact assessment of information and communication technologies at city level"

– [ITU-T L.1451] "Methodology for assessing the aggregated positive sector-level impacts of ICT in other sectors"

However, these Recommendations are not providing the guidance needed to address target 3.4. Moreover, there are limitations in availability of data and methodologies. However, ITU-T has recently developed [ITU-T L.1480] to provide the required guidance and to complement existing Recommendations by providing the necessary, more detailed, guidance on the assessment of second order and higher effects for various purposes, as well as other effects. This Recommendation will provide methodological guidance that could support the evaluation of Connect 2030 target 3.4. However, it is observed that such assessments are complicated and need substantial lead time and resources to be performed.

With [ITU-T L.1480] there is sufficient methodological guidance in place to assess the effect of specific ICT solutions. However, it is noted that deriving the net telecommunication GHG abatement compared to a 2015 baseline, requires such a baseline to be established. This does not seem feasible, since it seems difficult to backtrack data for 2015. Especially, since this refers to data that ITU is not collecting on a regular basis, and data would need to be collected from various sources.

With respect to data availability, keeping track of the current situation could also prove challenging, since, for the time being, there is a lack of published high quality data.

A final challenge is the concept of "net abatement". ICT is a general-purpose technology, which means that its possible usages are very large. For this reason, it would not be possible to derive the total effect of ICT using micro- or meso-level methods (i.e., at the scale of users, organizations and communities). A more common approach would be to identify a selection of applications, derive their impact, and measure how it evolves over time. Capturing the overall enabling effect encompassing all solutions and effects is complicated and would demand the use of complementary macro level methodologies.

8 Way forward for quantification of net ICT GHG second order effects

Acknowledging the situation outlined in clause 7, this clause proposes a way forward towards a deeper understanding of ICT second order effects.

ITU-T provides detailed guidance in [ITU-T L.1480], which will enable ITU to evaluate the contribution from selected ICT solutions for which data is available. For this reason, it is recommended that ITU should investigate how to contribute to the assessment of second order effects of ICT solutions by applying [ITU-T L.1480].

For future targets, there is an opportunity to monitor the development of the ICT sector itself based on the trajectories of [ITU-T L.1470], and the methodology for assessment of the ICT sector GHG emissions in [ITU-T L.1450]. ITU-T is also developing guidance on how to set up a database describing how data related to GHG emissions in the ICT sector could be collected and aggregated.

Future targets could also refer to [ITU-T L.1480] combined with appropriate data collection and establishment of a baseline to keep track of the contribution from selected ICT solutions representative of the second order effects. Moreover, future targets could also consider the impacts on results from other effects, in particular rebound effects.

9 A non-comprehensive list of ICT solution with potential positive second order effects to help reduce overall GHG emissions in society

This clause gives a non-comprehensive list of ICT solutions, the use of which could potentially enable a reduction of GHG emissions.

Table 1 – Some ICT solutions that could help reduce GHG emissions

Sector	Solution	Mechanism
Energy supply transformation and consumption	Improved metering and forecasting of electricity supply and demand	Optimization
	Optimization of grids, including load balancing through demand response	Optimization
	Improved energy system through demand side management	Optimization
Industry	As-a-service and sharing solutions	Optimization and/or substitution
	Circularity	Optimization
	Production efficiency	Optimization
Buildings	Intelligent building energy and resource management	Optimization
	Optimized use and sharing of buildings	Optimization and/or substitution

Table 1 – Some ICT solutions that could help reduce GHG emissions

Sector	Solution	Mechanism
Transport	Virtual meetings	Substitution
	Remote work	Substitution
	Route optimization	Optimization
	Fleet management and logistics	Optimization
	Eco-driving	Optimization
	Shared mobility	Optimization and/or substitution
Agriculture and forestry	Precision agriculture	Optimization
	Precision forestry	Optimization
Nature-based sinks	Forest protection	Providing information and managing data, Facilitation, accessibility, affordability and rising motivation

Bibliography

[b-ITU-T L.1400] Recommendation ITU-T L.1400 (2023), *Overview and general principles of methodologies for assessing the environmental impact of information and communication technologies*.

[b-UNFCCC GCP] United Nations Framework Convention on Climate Change (2021). Glasgow Climate Pact. Glasgow: United Nations. 8 pp. Available [viewed 2023-02-16] at: https://unfccc.int/documents/310475

[b-UNFCCC PA] United Nations Framework Convention on Climate Change (2015). Paris agreement. New York, NY: United Nations. 27 pp. Available [viewed 2023-02-16] at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf

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