

Recommendation

ITU-T L.1400 (03/2023)

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

Overview and general principles of methodologies for assessing the environmental impact of information and communication technologies

ITU-T L-SERIES RECOMMENDATIONS

ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

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Cable evaluation	L.125–L.149
Guidance and installation technique	L.150–L.199
OPTICAL INFRASTRUCTURES	
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E-WASTE AND CIRCULAR ECONOMY	L.1000–L.1199
POWER FEEDING AND ENERGY STORAGE	L.1200–L.1299
ENERGY EFFICIENCY, SMART ENERGY AND GREEN DATA CENTRES	L.1300–L.1399
ASSESSMENT METHODOLOGIES OF ICTS AND CO2 TRAJECTORIES	L.1400–L.1499
ADAPTATION TO CLIMATE CHANGE	L.1500–L.1599
CIRCULAR AND SUSTAINABLE CITIES AND COMMUNITIES	L.1600–L.1699
LOW COST SUSTAINABLE INFRASTRUCTURE	L.1700–L.1799

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T L.1400

Overview and general principles of methodologies for assessing the environmental impact of information and communication technologies

Summary

Recommendation ITU-T L.1400 presents the general principles on assessing the environmental impact of information and communication technologies (ICTs) and outlines the different methodologies that have been developed in the L.1400-series:

- Assessment of the environmental impact of ICT goods, networks and services
- Assessment of the environmental impact of ICT projects
- Assessment of the environmental impact of ICT in organizations
- Assessment of the environmental impact of ICT in cities
- Assessment of the environmental impact of the ICT sector
- Assessment on how the use of ICT solutions impacts greenhouse gas (GHG) emissions of other sectors
- Decarbonization trajectories for the ICT sector
- Net zero guidance for ICT organizations
- Guidance on how to address the ITU's Connect 20xx targets

The Recommendation describes the intended usage of each Recommendation and the connections between them.

Finally, it lists ongoing work items.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T L.1400	2011-02-22	5	11.1002/1000/11015
2.0	ITU-T L.1400	2023-03-22	5	11.1002/1000/15182

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Assessment, decarbonization, energy consumption, environmental impact, greenhouse gases, ICT, impact categories, LCA, lifecycle assessment, net zero.

* 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

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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

Information and communication technologies (ICTs) deliver innovative products and services which are transforming the way we live. Such solutions could help society to reduce its use of resources and may enable reductions in greenhouse gas (GHG) emissions in different sectors, such as manufacturing, transport, logistics, buildings and electric grids, by allowing them to develop and work more efficiently.

At the same time, ICT solutions have their own footprint and energy efficiency measures must continuously address the challenge keep up with or outperform data traffic growth. Moreover, ICT solutions may be used to maintain the profitability of industries such as fossil-based industries, thereby counteracting emission reductions.

Given these different effects, when using ICT, it becomes increasingly important to consider and evaluate not only the environmental impacts of the ICT sector itself, but also the environmental benefits that the usage of ICT and ICT services can have in many other sectors, as well as any detrimental effects.

Figure 1 shows that ICTs have both positive and negative effects on the environment. The negative effect is traditionally calculated by the environmental load caused by the physical existence of ICT goods, network and services and the processes associated with its full lifecycle, such as the consumption of energy and natural resources and generation of waste. This also includes usages with detrimental effects and any negative societal effect that supports environmental load intensive industries and lifestyles. On the positive impact side, usage of ICT could enable dematerialization and decarbonization e.g., by transporting information instead of physical objects, thus reducing movement and transportation, as well as e.g., helping to operate energy production, distribution and storage more efficiently. Moreover, the use of ICT could also allow positive societal effects by enabling changes to more sustainable operations and lifestyles.

To support the transition to a more sustainable society, we must act to minimize any negative effects of ICT and maximize the positive ones. To this end, methodologies should consider both the positive and negative environmental effects of ICT.

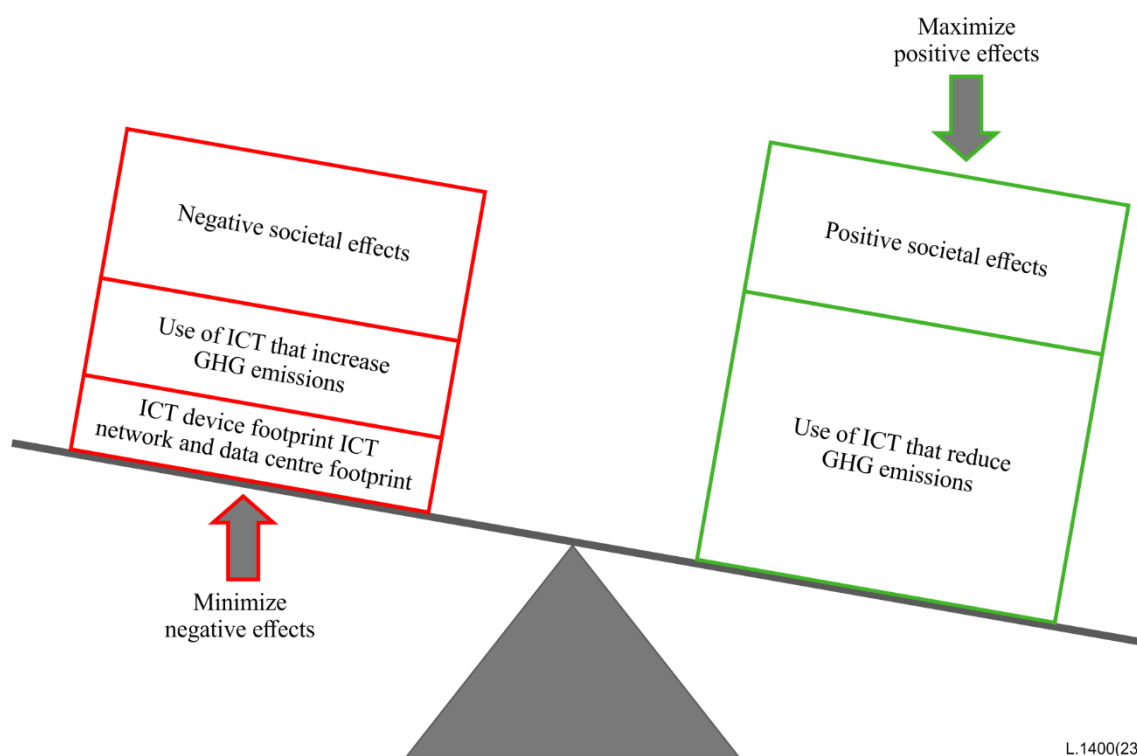


Figure 1 – Environmental effects of ICT

The quantification of such effects is addressed by ITU-T with a series of Recommendations dealing with the methodology for the assessment of environmental impacts of ICT from different perspectives, ranging from individual products to societal level taking into account impacts of both products and services and organizations.

In many cases, these ICT-specific Recommendations complement generic standards by other standards development organizations and major initiatives (e.g., ISO, SBTi and GHG Protocol) acknowledging the necessity of collaborating effectively internationally to avoid, to the extent possible, duplication and potentially conflicting points of view.

Recommendation ITU-T L.1400

Overview and general principles of methodologies for assessing the environmental impact of information and communication technologies

1 Scope

This Recommendation specifies:

- the content and structure of the ITU-T L.1400-series of Recommendations on methodologies for environmental impact assessments of ICT;
- general principles for these methodologies;
- presentation of all published Recommendations and Supplements in the series, as well as of ongoing work items.

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.1420] Recommendation ITU-T L.1420 (2012), *Methodology for energy consumption and greenhouse gas emissions impact assessment of information and communication technologies in organizations*.
- [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 (2019), *Methodology for assessing the aggregated positive sector-level impacts of ICT in other sectors*.
- [ITU-T L.1460] Recommendation ITU-T L.1460 (2018), *Connect 2020 greenhouse gases emissions – guidelines*.
- [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.1471] Recommendation ITU-T L.1471 (2021), *Guidance and criteria for information and communication technology organizations on setting net zero targets and strategies*.
- [ITU-T L.1480] Recommendation ITU-T L.1480 (2022), *Enabling the net zero transition: Assessing how the use of ICT solutions impacts GHG emissions of other sectors*.
- [ITU-T L.1481] Recommendation ITU-T L.1481 (2022), *Guidance on how to address the Connect 2030 targets on net Abatement*.

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.

NOTE 3 – This definition has been amended from [ITU-T L.1410].

3.1.2 GHG project [b-ISO 14064-1]: An activity or activities that alter the conditions of a GHG baseline and which cause GHG emission reductions or GHG removal enhancements.

3.1.3 greenhouse gas (GHG) [b-ISO 14064-1]: Gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds.

NOTE 1 – For a list of GHGs, see the latest Intergovernmental Panel on Climate Change (IPCC) Assessment Report.

NOTE 2 – Water vapour and ozone are anthropogenic as well as natural GHGs, but are not included as recognized GHGs due to difficulties, in most cases, in isolating the human-induced component of global warming attributable to their presence in the atmosphere.

NOTE 3 – GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

3.1.4 greenhouse gas emission [b-ISO 14064-1]: Release of a GHG into the atmosphere.

3.1.5 greenhouse gas removal [b-ISO 14064-1]: Withdrawal of a GHG from the atmosphere by GHG sinks.

3.1.6 higher order effects [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 include effects occurring through 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 is 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.

3.1.7 ICT goods [ITU-T L.1410]: Tangible goods deriving from or making use of technologies devoted to or concerned with:

- the acquisition, storage, manipulation (including transformation), management, movement, control, display, switching, interchange, transmission or reception of a diversity of data;
- the development and use of the hardware, software, and procedures associated with this delivery; and
- the representation, transfer, interpretation, and processing of data among persons, places, and machines, noting that the meaning assigned to the data is preserved during these operations.

NOTE – [b-ETSI TS 103 199] used the word "equipment" instead.

3.1.8 ICT network [ITU-T L.1410]: Set of nodes and links that provide physical or over the air information and communication connections between two or more defined points.

EXAMPLE – Wireless network, fixed network, local area network (LAN), home network and server network, access networks, core networks, cloud computing networks.

3.1.9 information and communication technology ICT project [ITU-T L.1430]: A set of activities intended to implement a specific task that uses mainly ICT goods, networks and services. The task may consist of undertaking one or more ICT project activities with the ICT goods, networks and services.

NOTE – See the OECD definition of the ICT sector <https://www.oecd.org/sti/ieconomy/2771153.pdf>

3.1.10 ICT service (application) [ITU-T L.1410]: Use of ICT goods and/or networks to provide value to one or more users.

EXAMPLE – Teleconferencing, teleworking, e-ticketing, e-learning, e-healthcare, smart transport and logistics, procurement systems, supply chain management systems, music/film distribution over the Internet or voice over IP, machine-to-machine systems.

3.2.11 ICT solution [ITU-T L.1480]: A system encompassing ICT goods, ICT networks and/or ICT services that contributes to meeting a technical, societal or business challenge.

3.1.12 organization [b-ISO 14001]: Company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration.

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

NOTE 1 – Second order effects can be either actual or potential.

NOTE 2 – This definition has been amended from [ITU-T L.1410].

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 ICT sector: A combination of manufacturing and services industries that capture, transmit and display data and information electronically.

NOTE – Based on the OECD description of the ICT sector [b-OECD]

3.2.2 scope 1 emission: Direct GHG emission greenhouse gas emission from sources owned or directly controlled by the organization.

NOTE – Based on GHG Protocol Corporate Accounting and Reporting Standard and ISO IWA42 Net Zero Guidelines.

3.2.3 scope 2 emission: Indirect GHG emission due to greenhouse gas emission from the generation of purchased electricity, heat, cooling or steam consumed by the organization.

NOTE – Based on GHG Protocol Corporate Accounting and Reporting Standard and ISO IWA42 Net Zero Guidelines.