

International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

L.1420

(02/2012)

SERIES L: CONSTRUCTION, INSTALLATION AND
PROTECTION OF CABLES AND OTHER ELEMENTS OF
OUTSIDE PLANT

**Methodology for energy consumption and
greenhouse gas emissions impact assessment
of information and communication technologies
in organizations**

Recommendation ITU-T L.1420



International
Telecommunication
Union

Document Sharing Hub

Recommendation ITU-T L.1420

Methodology for energy consumption and greenhouse gas emissions impact assessment of information and communication technologies in organizations

Summary

Recommendation ITU-T L.1420 presents the methodology to be followed if an organization intends to claim compliance with this Recommendation when assessing its information and communication technology (ICT) related energy consumption and/or greenhouse gas (GHG) emissions.

This Recommendation can be used to assess energy consumption and GHG emissions generated over a defined period of time for the following purposes: for assessment of related impact from ICT organizations or for assessment of impact from ICT related activities within non-ICT organizations.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T L.1420	2012-02-06	5

Keywords

ICT, assessment, energy consumption, greenhouse gases, GHG, scope 1, scope 2, scope 3, direct GHG emissions, energy indirect GHG emissions, other indirect GHG emissions

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

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2012

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

	Page
1 Scope	1
1.1 Assessment of impact from the use of ICT in non-ICT organizations.....	1
1.2 Assessment of impact from ICT organizations	1
2 References.....	2
3 Definitions	2
3.1 Terms defined elsewhere	2
3.2 Terms defined in this Recommendation.....	3
4 Abbreviations and acronyms	4
5 Conventions	4
6 Principles of organizational assessment	4
7 Evaluation of energy consumption and GHG impact of ICT activities in non-ICT organizations.....	5
7.1 Use of the Recommendation ITU-T L.1410 to assess the impact from the use of ICT in organizations	5
7.2 Aggregation of impacts from ICT goods, networks and services at an organizational level	5
7.3 Organizational boundaries.....	6
7.4 Operational boundaries.....	6
8 Evaluation of energy consumption and GHG impact of ICT organizations	7
8.1 General	7
8.2 Energy and GHG inventory design and development.....	7
8.3 Quantification of energy consumption and GHG emissions.....	8
8.4 Annual assessment.....	12
8.5 Establishment of base-year energy and GHG inventory	12
8.6 Assessing and reducing uncertainty	13
8.7 Energy and GHG inventory quality management	13
8.8 Reporting of energy and GHG inventory	14
9 Organization's role in verification activities.....	16
Annex A – List of goods to be considered when assessing the impact of ICT activities in organizations.....	17
Annex B – Information to be provided in the GHG emission and energy report on scope 1 and scope 2 GHG emissions and energy consumption.....	18
Appendix I – Indirect GHG emissions categories	20
Appendix II – Examples of organizational activities to reduce GHG emissions and energy consumption.....	23
Bibliography.....	25

Introduction

This Recommendation assists organizations in assessing the energy consumption and greenhouse gas (GHG) emissions related to their operations. It provides the necessary knowledge to prepare inventories and meet the societal demands emerging from a low-carbon economy and the challenge of higher energy prices.

The Recommendation focuses on the energy consumption and GHG emissions resulting from ICT activities and ICT organizations.

This Recommendation covers

- The assessment of the life cycle perspective environmental impact of ICT goods, networks and services used by a non-ICT organization ("ICT in organizations"), e.g., PCs, servers, data centers and networks within the organizations premises, based on the Recommendation ITU-T L.1410 and an aggregation to an organizational level for first and second order effects.
- The assessment of the environmental impact of an ICT organization ("ICT organizations") based on [ISO 14064-1] and [b-GHG Protocol].
- The interpretation of these impacts.
- The reporting of these impacts in a transparent manner.

Recommendation ITU-T L.1420

Methodology for energy consumption and greenhouse gas emissions impact assessment of information and communication technologies in organizations

1 Scope

The increasing proliferation of information and communications technology (ICT) has led to concerns regarding its environmental impact. Taking into consideration the ongoing efforts within the United Nations Framework Convention on Climate Change (UNFCCC) to combat climate change, ITU-T decided to develop an internationally agreed upon methodology to help the ICT Sector to make an inventory of the environmental impact, including greenhouse gas emissions and energy consumption, of ICTs in organizations.

This Recommendation can be used to assess the energy consumption and GHG emissions of ICT related to organizations for two different purposes.

- Firstly, it can be used to assess the life cycle GHG emissions (first and second order effects) emerging from the use of ICT in non-ICT organizations, based on the Recommendation ITU-T L.1410.
- Secondly, it can be used as a supplement to [ISO 14064-1] and to [b-GHG Protocol] for ICT organizations intending to assess their own organizational energy consumption and GHG related impact.

This Recommendation is intended to allow organizations to assess their direct GHG emissions (generally referred to as scope 1), their indirect GHG emissions (generally referred to as scope 2) and their other indirect GHG emissions (generally referred to as scope 3). It also allows organizations to assess their energy consumption by developing an energy inventory focusing on secondary energy used by the assessed organization itself.

However, it should be noted that this Recommendation will not address:

- GHG removal, which needs not be considered since ICT activities do not directly remove GHG,
- Other effects (apart from first or second order effects), such as rebound effects, since these effects are still under research to a large extent,
- Other environmental impacts like for example depletion of abiotic resources, acidification, eutrophication, stratospheric ozone depletion, photo-oxidant formation and human toxicity.

1.1 Assessment of impact from the use of ICT in non-ICT organizations

For the assessment of the first and second order effects when using ICT in non-ICT organizations, this Recommendation defines an assessment framework (principles, concepts, requirements and methods) to be used by any kind of organization (except for ICT organizations) when quantifying and reporting the energy consumption and the GHG emissions of ICT activities.

1.2 Assessment of impact from ICT organizations

For the assessment of an ICT organization, this Recommendation provides a methodology to assess both the energy consumption and the GHG emissions of its activities over a certain period of time for the following emissions:

- direct GHG emissions
- energy indirect GHG emissions and
- other indirect GHG emissions.

This Recommendation covers the following items:

- design and development of the inventory
- components of the inventory
- quality management requirements of the inventory
- reporting of the inventory results.

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.1400] Recommendation ITU-T L.1400 (2011), *Overview and general principles of methodologies for assessing the environmental impact of information and communication technologies*.
- [ITU-T L.1410] Recommendation ITU-T L.1410 (In-force), *Methodology for environmental impact assessment of information and communication technology goods, networks and services*.
- [ISO 14064-1] ISO 14064-1:2006, *Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 activity data [b-GHG PI]: A quantitative measure of a level of activity that results in GHG emissions. Activity data is multiplied by an emission factor to derive the GHG emissions associated with a process or an operation. Examples of activity data include kilowatt-hours of electricity used, volume of fuel used, output of a process, hours a piece of equipment is operated, distance travelled and area of building.

3.1.2 emission factor [b-PAS 2050]: Amount of greenhouse gases emitted, expressed as carbon dioxide equivalent and relative to a unit of activity (or example, kgCO₂e per unit input).

3.1.3 facility [ISO 14064-1]: Single installation, set of installations or production processes (stationary or mobile), which can be defined within a single geographical boundary, organizational unit or production process.

3.1.4 first order effect [ITU-T L.1410]: The impacts and opportunities created by the physical existence of ICT and the processes involved, e.g., GHG emissions, e-waste, use of hazardous substances and use of scarce, non-renewable resources.

3.1.5 greenhouse gas [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. Greenhouse gas include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆).

3.1.6 greenhouse gas emission [ISO 14064-1]: Total mass of a Greenhouse gas released to the atmosphere over a specified period of time.

3.1.7 greenhouse gas removal [ISO 14064-1]: Total mass of a Greenhouse gas removed from the atmosphere over a specified period of time.

3.1.8 ICT goods [ITU-T L.1400]: The tangible products deriving from or making use of technologies devoted to or concerned with (a) the study and application of data and the processing thereof; *i.e.*, the automatic acquisition, storage, manipulation (including transformation), management, movement, control, display, switching, interchange, transmission or reception of a diversity of data; (b) the development and use of the hardware, software, and procedures associated with this delivery; and (c) the representation, transfer, interpretation, and processing of data among persons, places, and machines, noting that the meaning assigned to the data must be preserved during these operations.

3.1.9 ICT networks [ITU-T L.1400]: This includes a set of nodes and links that provide physical or over the air information and communication connections between two or more defined points.

3.1.10 ICT services [ITU-T L.1400]: This covers the combination of ICT goods and ICT networks. An ICT service is produced in one or more nodes of the network and provided to users or other ICT systems over the ICT network.

3.1.11 organization [ISO 14064-1]: 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.

3.1.12 second order effect [ITU-T L.1410]: The impacts and opportunities created by the ongoing use and application of ICT. This includes environmental load reduction effects which can be either actual or potential.

3.1.13 validation [ISO 14064-1]: Systematic, independent and documented process for the assessment of a greenhouse gas assertion in a GHG project plan against agreed validation criteria.

3.1.14 verification criteria [ISO 14064-1]: Policy, procedure or requirement used as a reference against which evidence is compared. Validation or verification criteria may be established by governments, GHG programmes, voluntary reporting initiatives, standards or good practice guidance.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 direct GHG emissions [b-GHG PI]: GHG emissions from GHG sources owned or controlled by the organization.

NOTE – This term is referred to as "scope 1 emissions" in [b-GHG PI].

3.2.2 energy indirect GHG emissions [b-GHG Protocol Initiative]: Energy indirect GHG emissions cover GHG emissions from the generation of purchased energy, heat or steam consumed by the organization. Purchased electricity, heat or steam is defined as electricity, heat or steam that is purchased or otherwise brought into the organizational boundary of the company from external source.

NOTE – This term is referred to as "scope 2 emissions" in [b-GHG PI].

3.2.3 equity share: An equity share is defined as the percentage of economic interest in, or benefit derived from a facility.

3.2.4 ICT activities: ICT activities are defined as activities directly related to the design, production, promotion, sales or maintenance of ICT goods, networks or services, or related to the use of ICT goods, networks or services for the benefit of the organization.

3.2.5 ICT organization: An ICT organization is an organization, the core activity of which is directly related to the design, production, promotion, sales or maintenance of ICT goods, networks or services.

3.2.6 operational control: An organization has operational control if it has the full authority to introduce and implement its operating policies at the operation level.

3.2.7 other indirect GHG emissions [b-GHG PI]: Other indirect GHG emissions cover GHG emissions, other than energy indirect GHG emissions, which are a consequence of an organization's activities but arise from GHG sources that are controlled by other organization. This term is referred to as scope 3 in [b-GHG Protocol].

NOTE – This term is referred to as "scope 3 emissions" in [b-GHG PI].

3.2.8 primary energy: Primary energy is the energy embodied in natural resources prior to undergoing any human-made conversions or transformations.

3.2.9 secondary energy: Secondary energy is energy which has been refined from primary energy in an energy conversion process to a more convenient form of energy, such as electricity, refined or synthetic fuels (e.g., gasoline and hydrogen fuel).

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CO₂: Carbon Dioxide

CO₂e: CO₂ equivalent

EoLT: End-of-Life Treatment

GHG: Greenhouse Gas

GWP: Global Warming Potential

ICT: Information and Communication Technology

IPCC: Intergovernmental Panel on Climate Change

kWh: kiloWatt-hours

LCA: Life Cycle Assessment

PC: Personal Computer

5 Conventions

None.

6 Principles of organizational assessment

The following principles shall be taken into consideration when carrying out the assessment.

- **Relevance**
Select energy or GHG sources, data and methods appropriate to the assessment of the energy consumption or GHG emissions of ICT activities and organizations.
- **Completeness**
Include all specified energy sources or GHG emissions that provide a material contribution to the overall results.

- **Consistency**
Enable meaningful comparisons of energy consumption or GHG emissions over time with respect to energy consumption, respectively GHG-related information of an organization.
- **Accuracy**
Reduce bias and uncertainties as far as practicable.
- **Transparency**
When communicating inventory results, the organization shall give sufficient information to support the interpretation of the results.

7 Evaluation of energy consumption and GHG impact of ICT activities in non-ICT organizations

The evaluation of the life cycle energy consumption and GHG impact of first and second order effects when using ICT in organizations should be based on [ITU-T L.1410] and aggregated to an organizational level according to the principles outlined in this Recommendation.

It should be noted that the assessment of the second order effects needs to be documented and reported separately from the first order GHG emission impact.

Clause 7 covers the use of ICT in any kind of organization, except for ICT organizations, including but not limited to organizations such as banks, insurance companies and public administrations.

7.1 Use of the Recommendation ITU-T L.1410 to assess the impact from the use of ICT in organizations

When assessing the impact of the use of ICT, the organization shall:

- Identify the concerned ICT goods, networks or services of which the organization would like to assess the impact.
- Define operational boundaries for all these selected ICT goods, networks and services.
- If results from life cycle assessments (LCAs) are not available, perform an assessment of these product systems of ICT goods, networks and services in accordance with Part I of [ITU-T L.1410] in order to calculate the life cycle impact of these product systems.

If the intention is also to capture the second order effects of the use of ICT goods, networks or services, a comparative assessment according to Part II of [ITU-T L.1410] needs also to be performed.

7.2 Aggregation of impacts from ICT goods, networks and services at an organizational level

When the selected product systems have been assessed as described above, the result needs to be aggregated to an organizational level.

A simplified example could be given as follows: if the annual impact of a single PC is x kg CO₂e and the organization owns n PCs, then the organizational impact of the PCs is $n \cdot x$ kg CO₂e. This example is only applicable if the GHG emissions of the electricity mix (and other use conditions) are consistent for all the PCs within the scope of the assessment.

Correspondingly, a simplified example for a service is as follows: if the actual or potential saving per meeting of utilizing a telepresence system instead of travelling is y kg CO₂e, and the company has saved m meetings a year between the same destinations with z travelling participants, the total savings at an organizational level becomes $y \cdot m \cdot z$ kg CO₂e.