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

Recommendation ITU-T L.1400

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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 (ICT) and outlines the different methodologies that are being developed:

- 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 ICT in countries or group of countries.

This Recommendation also provides some examples of opportunities to reduce the environmental load due to ICT.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T L.1400	2011-02-22	5

Keywords

Assessment, energy consumption, environmental impact, greenhouse gases, ICT.

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.

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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/.

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Introduction

Information and communication technologies (ICT) delivers innovative products and services which are transforming the way we live. At the same time, ICT enables other sectors such as manufacturing, logistics, buildings and electric grids to develop and work more efficiently. When using ICT, it becomes increasingly important to consider and evaluate not only environmental impacts of the ICT sector itself, but also the environmental reduction benefits (enabling effect) that the usage of ICT and ICT services can have in many other sectors.

There exist some estimates (see Bibliography) indicating that the enabling effect of ICT could be important. In this context, cooperation and optimization across sectors of the economy is an opportunity.

Figure 1 shows that ICTs have both positive and negative effects on the environment. The negative factor is traditionally calculated by the environmental load caused by ICT devices and equipment, such as the consumption of energy and natural resources and generation of waste. On the positive impact side, ICT services can make lifestyle and business operations more energy efficient. They can do so by, for example, enabling dematerialization, which means transporting information instead of physical objects thus reducing movement and transportation. This efficiency of lifestyle and its underlying business activities can indirectly reduce the environmental load of human activities.

Towards constructing a sustainable society from an environmental viewpoint, we should act to minimize the negative factors of ICT and maximize the positive ones. To this end, both the positive and negative environmental aspects of ICT shall be quantified.

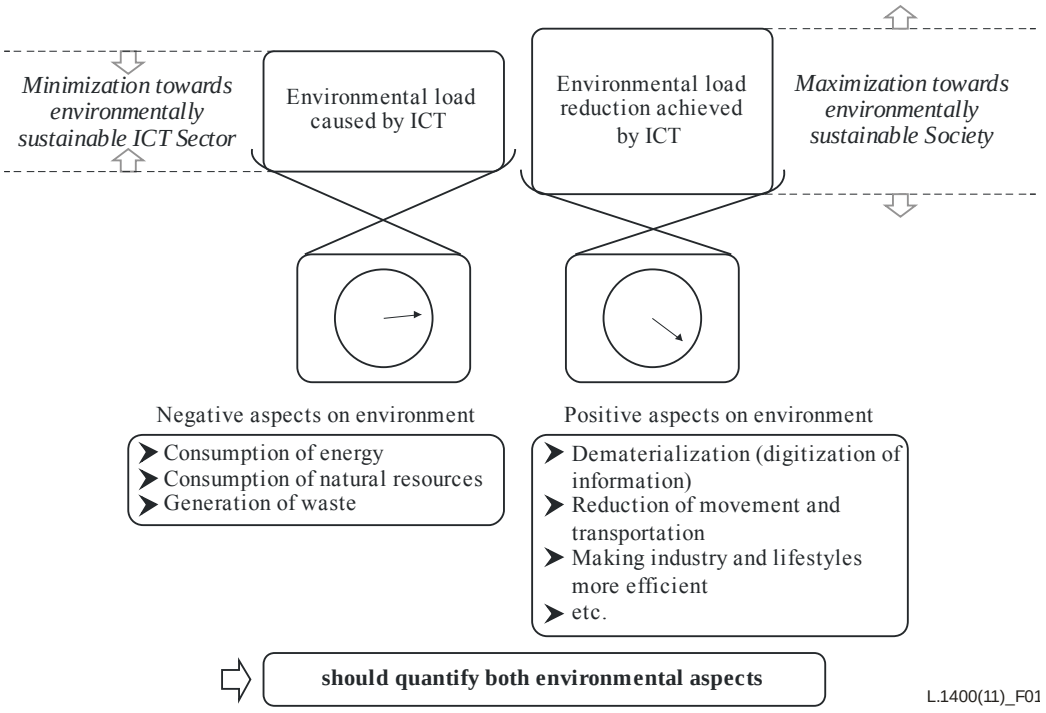

Figure 1 – Environmental aspects of ICT

The quantification of these two aspects is proposed by ITU-T with a series of Recommendations dealing with the methodology for the assessment of environmental impacts of:

- ICT goods, networks, and services
- ICT project

- ICT in organization
- ICT in cities.

NOTE 1 – Potentially some other administrative areas could be covered with the assessment of environmental impacts of cities.

- ICT in countries

NOTE 2 – A group of countries, for instance the European Union countries or OECD countries, regions inside a country and potentially some other administrative areas could be covered with the assessment of environmental impacts of countries.

It should be noted that the assessment of impacts of ICT requires the definition of boundaries and that results of assessments may vary significantly depending upon the selection of boundaries. In all cases, boundaries should be documented.

Additionally the Recommendations will include an overview of relevant standards created in other SDOs (e.g., [ISO 14040] and [ISO 14044]) noting that it is necessary to collaborate effectively internationally to avoid 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 structure of the ITU-T L.1400-series of Recommendations, methodology of environmental impact assessment of ICT;
- general principles of methodology among Recommendations regarding the environmental impact assessment of ICT;
- mention of relevant methodologies in other SDOs;
- presentation of each Recommendation from the future ITU-T L.1400-series Recommendations on methodology.

This Recommendation refers to documents that are being considered for preparation in the area of general principles of methodologies for assessing the environmental impact of ICTs. The specific designation of these documents (marked by *) will be indicated once approved for publication.

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.

[ISO 14040] ISO 14040:2006, *Environmental management – Life cycle assessment – Principles and framework*.

[ISO 14044] ISO 14044:2006, *Environmental management – Life cycle assessment – Requirements and guidelines*.

[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*.

[ISO 14064-2] ISO 14064-2:2006, *Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements*.

[ISO 14064-3] ISO 14064-3:2006, *Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

The following terms are defined in [ISO 14064-1]:

3.1.1 GHG project: An activity or activities that alter the conditions identified in the baseline scenario which cause GHG emission reductions or GHG removal enhancements.

3.1.2 greenhouse gas (GHG): 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.

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

3.1.3 greenhouse gas emission: Total mass of a GHG released to the atmosphere over a specified period of time.

3.1.4 greenhouse gas removal: Total mass of a GHG removed from the atmosphere over a specified period of time.

3.1.5 organization: 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.

3.1.6 validation: Systematic, independent and documented process for the assessment of a greenhouse gas assertion in a GHG project plan against agreed validation criteria.

3.1.7 verification criteria: 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.

The following term is defined in [ISO 14064-2].

3.2 Terms defined in this Recommendation

The definitions hereafter are related to a wide targeted scope of assessment of impacts. The exact coverage of each Recommendation from the ITU-T L.1400-series Recommendations will be improved and further developed in each version of each Recommendation.

This Recommendation defines the following terms:

3.2.1 ICT goods

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.

This definition may be improved and further developed or complemented in the different ITU-T L.1400-series Recommendations.

3.2.2 ICT networks

A set of nodes and links that provide physical, or over the air, information and communication connections between two or more defined points.

This definition may be improved and further developed or complemented in different ITU-T L.1400-series Recommendations to be prepared in the future.

Examples are wireless network, fixed network, local area network (LAN), home network and server network, access networks, core networks, cloud computing networks.

3.2.3 ICT services

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.

This definition may be improved and further developed or complemented in the different ITU-T L.1400-series Recommendations.

Examples of services are teleconferencing, teleworking, e-ticketing, e-learning, e-healthcare, smart transport and logistics, procurement systems, supply chain management systems, music/film distribution over Internet or voice over IP, machine-to-machine systems.

3.2.4 ICT project

An ICT project is defined either as:

– a GHG project using mainly ICT goods, networks and services, aiming at GHG emission reductions, GHG removal enhancements; or

– a project using mainly ICT goods, networks and services, aiming at energy consumption savings and energy efficiency improvements.

3.2.5 ICT sector

The ICT sector represents economic activities including industries of which production of goods, networks and services shall be primarily intended to fulfil or enable the function of information processing and communication by electronic or optical means.

A definition of the ICT sector developed by the OECD can be found in Appendix I.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms.

GHG	Greenhouse Gas
ICT	Information and Communication Technologies
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
UNFCCC	United Nations Framework Convention on Climate Change
UN-HABITAT	United Nations Human Settlements Programme

5 Conventions

No particular convention is used in this Recommendation.

6 General principles

6.1 Environmental impacts categories

Several categories of assessments of environmental impacts may be performed in the field of ICT.

The categories hereafter are related to a wide targeted scope of assessment of impacts. The exact coverage of categories for each version of Recommendation will be improved and further developed in each version of each Recommendation.

The following categories of environmental impacts are commonly assessed:

- Global warming potential or greenhouse gas (GHG) emissions
- Energy consumption
- Raw material depletion
- Water depletion
- Ozone depletion
- Air toxic emissions
- Photochemical ozone creation
- Air acidification
- Water eutrophication
- Water toxic emissions
- Hazardous waste generation.

The series of ITU-T Recommendations on methodology listed in Appendix II will focus on both energyE consumption and greenhouse gas emissions.

This selection has been carried out in the context of two key concern areas:

- Oil production peak: an important number of experts consider that we are approaching a peak or rather a wavy plateau in the world's conventional oil production. After this period, which could start before 2020, the world's conventional oil production will decrease. It is expected that the price of energy will rise and security of supply will get harder in that context.
- Climate Change due to human activities: the IPCC (Intergovernmental Panel on Climate Change) considers that the impact of anthropogenic greenhouse gas on the Earth's climate change is very likely.

The evaluation of water depletion according to other environmental impact categories remains for further study.

6.2 Environmental load reduction by ICT

Using ICT can contribute to fewer materials, fewer components, less energy and less waste.

Environmental load reduction may come from, in particular, ICT dematerialization impact based on substituting higher carbon products and activities with ICT-enabled lower carbon alternatives. These alternatives include:

– Online media
– E-ticketing
– E-commerce
– E-paper
– Videoconferencing
– Teleworking or other remote-participation service.

The effectiveness of dematerialization in reducing carbon emissions depends on behavioural changes and infrastructure availability. In this context, there could be possible rebound effects, i.e., increased use. It should be noted in addition that the aggregated effects of large numbers of people using ICT makes more complex the assessment of ICT impacts over the medium to long term.

Some reports have analysed the emission reduction opportunities in other sectors via using ICT. Potential areas for greater efficiency include, e.g., industrial systems, transports, buildings and electric grids.

Using ICTs can enhance the efficiency of energy use, can enhance the efficiency of and reduce the production and consumption of goods, and can reduce the movement of people and goods, and can produce the effects listed in Table 6.2-1.

Table 6.2-1 – Environmental load possible reduction effects by using ICTs

Categories	Effects
Consumption of materials	By reducing material consumption (dematerialization), the environmental load related to goods production and disposal as well as waste generation can be reduced.
Power consumption/ energy use	By enhancing the efficiency of power and energy use to reduce consumption, the environmental load related to power generation, power transmission, etc. can be reduced.
Movement of people	By reducing the movement of people, the environmental load required for transportation can be reduced.
Movement of materials	By reducing the movement of materials, the environmental load required for transportation can be reduced.
Improved efficiency of office space	By using office space efficiently, power consumption for lighting, air conditioning, etc. can be reduced, thus reducing environmental load.
Storage of goods	By reducing storage space of goods, power consumption for lighting, air conditioning, etc. can be reduced, thus reducing environmental load.
Improved work efficiency	By enhancing work efficiency, the environmental load can be reduced.
Waste	By reducing waste emissions, the environmental load required for environmental preservation as well as for waste disposal can be reduced.
NOTE – This list of categories is not exhaustive. The metrics relative to environmental load reduction are different according to the categories of environmental impacts.	

6.3 Different kinds of assessments in different contexts

Several kinds of environmental impact assessments may be distinguished.

6.3.1 Impacts at goods, networks or services level

The following kinds of impacts may be assessed in the field of ICT:

- Impact of ICT goods (definition of ICT goods in clause 3.2.1)
- Impact of ICT networks (definition of ICT networks in clause 3.2.2)
- Impact of ICT services (definition of ICT services in clause 3.2.3).

For goods, networks and services, different functional units may be considered: for instance, the time during which one uses a phone, the number of e-mails sent, the quantity of data transmitted over a network, the time during which one uses a videoconference service.

The assessment of impacts of ICT goods, networks, and services requires the definition of boundaries. BoundariesB should be documented.

The assessment may be limited to one part of the life cycle of the good or the service or extended to the entire life cycle, including, for example, raw material extraction, component manufacturing, assembly, transport and distribution, use, recycling and waste management.

For goods, networks and services impacts, the responsibility of the impacts is spread over the supply chain. The timeframe is synthetic, in the sense that it aggregates estimation of processes' impacts spread over time and space. The estimations may obviously vary over time when the processes vary.

For goods, networks and services impacts, life cycle assessments (LCAs) are commonly performed.

[ISO 14040] describes the principles and framework for LCA and [ISO 14044] specifies requirements and provides guidelines for LCA including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, the relationship between the LCA phases, and conditions for use of value choices and optional elements.

Load reduction impacts at goods, networks or services level

ICT goods, networks and services continuous development provides a possibility, when implemented and adopted, for:

– Improvement in energy efficiency
– Reduction in energy consumption
– Reduction in emissions throughout the whole life cycle of goods and services
– Sustainable materials and elimination of hazardous materials
– Fewer components and fewer materials, including packaging
– Lower impacts with converged, multi-functional goods.

For ICT goods, networks and services there could be significant GHG emissions mitigation opportunities by using them in large GHG emissions from other sectors, including:

– Industry: motors and industrial process automation
– Service activities: enhanced efficiency
– Transport: logistics, private transport, efficient vehicles, traffic flow, smart street lighting
– Buildings: smart buildings, space reduction, energy use
– Power and heat: smart grid, efficient power generation, monitoring and control of feed-in energy from renewables, combined heat and power.

In the field of ICT, there is a particular interest in comparing a situation with an ICT service with its baseline scenario. For instance, comparing the environmental impacts of having a two-hour meeting travelling by plane between two cities with the environmental impacts of having a two-hour meeting via a videoconferencing service. This is an example of dematerialization based on ICT services, and can be applied as well in an individual life as in various industrial and societal contexts.

The comparison of impacts between two situations implies the assessment of environmental impacts in other relevant sectors and therefore needs their input. This consideration may be developed in a future ITU-T Recommentation L*.methodology_ICT goods, networks and services.

6.3.2 Impacts at an organization level

The assessment of impacts at an organization level (see definition in clause 3.1 for organization, companies are included) requires the definition of boundaries.

BoundariesB should be documented.

Different time frames may be considered. Unless differently indicated, a time frame of one year will be considered. This type of assessment will be performed after the selected time frame is elapsed.

The selection of data used to perform assessments should be documented and available for verification. Data of the best available quality should be selected.

This type of assessment may be verified by a third party after having been performed.

6.3.3 Impacts at project level

The assessment of impacts of ICT at a project level consists in estimating one or several types of environmental impacts associated with the launch of a project aiming at reducing those impacts, e.g., greenhouse gas emissions.

The validation assessment of impacts consists in estimating impacts of a project that has not started at the date when the assessment is performed.

One of the aims of this kind of assessment is to anticipate potential impacts of a project, to identify the activities within a project from where the main impacts are coming and to make decisions in order to reduce unwanted impacts and increase desired impacts.

The verification assessment of impacts consists in estimating impacts of a project, or a part of a project, that is terminated at the date when the assessment is performed. It may be performed by a third party.

The selection of data used to perform assessments should be documented and available for verification. Data of the best available quality should be selected.

6.3.4 Impacts at city or other administrative level

ICT can have an important role in greening urban development. For example, smart buildings and smart grids can create greater energy efficiency. Intelligent transport systems including electric vehicles, harbour and airport infrastructure make transport more energy efficient. Multimedia conferencing systems and teleworking technologies can reduce travel and its carbon footprint.

ICT can also have an important role in designing more energy efficient living infrastructure.

The assessment of impacts of ICT at city or some other administrative level requires the definition of city or some other administrative level boundaries.

Boundaries should be documented.

The selection of data used to perform assessments should be documented and available for verification. Data of the best available quality should be selected.

Different time frames may be considered. Unless differently specified, a time frame of one year will be considered.

6.3.5 Impacts at country or group of countries level

The assessment of impacts of ICT at a country or a group of countries, or a region within a country level, or some other administrative level, requires the definition of regional, national, international or some other administrative level boundaries.

Boundaries should be documented.

The selection of data used to perform assessments should be documented and available for verification. Data of the best available quality should be selected.

Different time frames may be considered. Unless differently specified, a time frame of one year will be considered.

6.4 General principles to follow

The application of principles is fundamental to ensure that the assessment of environmental impacts in the field of ICT results in a transparent and fair account.

The following general principles apply:

– Assessment of environmental impacts should be performed on a full life-cycle perspective for goods, networks and services assessment. Simplification of the LCA-based assessment process for goods, networks and services assessment could be envisaged or any combination of those models. This should be documented according to ISO standards.

– Boundaries should be selected, quoted, documented and made available for verification.

– Quantification methodologies should be selected, quoted, documented and made available for verification.

– Reliable data should be researched. Used data should be quoted, documented and made available for verification.

– Bias and uncertainties should be documented and reduced as far as it is practicable.

7 Overview of Recommendations on methodologies under preparation in ITU-T

7.1 List of the different methodology Recommendations

The following methodologies will be developed:

- Assessment of the environmental impacts of ICT goods, networks and services
- Assessment of the environmental impacts of ICT in organizations
- Assessment of the environmental impacts of ICT projects
- Assessment of the environmental impacts of ICT in cities
- Assessment of the environmental impacts of ICT in countries

The numbering of the different Recommendations is provided in Appendix II.

7.2 Explanation of the links between the Recommendations

Several Recommendations are prepared in order to tackle the different contexts of assessing ICT impacts.

Each Recommendation in the ITU-T L.1400-series will provide, when appropriate, the necessary references to other appropriate Recommendation(s) from the same series.

The following assessments:

- Assessment of the environmental impacts of ICT in organizations described in L*.methodology_ICT in organizations
- Assessment of the environmental impacts of ICT in cities described in L*.methodology_ICT in cities
- Assessment of the environmental impacts of ICT in countries described in L*.methodology_ICT in countries

may rely upon assessments of the environmental impacts of ICT goods, networks and services envisaged in L*.methodology ICT goods, networks and services, and assessments of the environmental impacts of ICT projects to be described in L*.methodology ICT projects.

7.3 Linkage among other relevant ITU-T Recommendations

Recommendations dealing with ICT and environment and climate change are under preparation in ITU-T. The development of these future Recommendations will take into account this Recommendation and the future Recommendations indicated in Appendix II.

8 General presentation of L*.methodology_ICT goods, networks and services

8.1 Introduction

This Recommendation provides the methodology focused on assessing the environmental impact of ICT goods, networks and services as follows:

- Environmental impact of ICT goods (see definition of ICT goods in clause 3.2.1).
- Environmental impact of ICT networks (see definition of ICT networks in clause 3.2.2).
- Environmental impact of ICT services (see definition of ICT services in clause 3.2.3).

The comparison of impacts between two situations implies the assessment of environmental impacts in other relevant sectors, and therefore needs input from the other relevant sectors. This may be considered in L*.methodology_ICT goods, networks and services.

To assess these impacts, the entire life cycle, including for example raw material acquisition, component manufacturing, assembly, transport and distribution, use, recycling and waste management, should be considered.

Therefore, it is necessary to follow life cycle assessment (LCA) principles which are standardized in [ISO 14040] and [ISO 14044].

Simplification of the LCA-based assessment process for goods, networks and services assessment could be envisaged and should be documented according to ISO standards.

8.2 Summary of existing standards

[ISO 14040] describes the principles and framework for LCA, and [ISO 14044] specifies requirements and provides guidelines for LCA, including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, the relationship between the LCA phases, and conditions for use of value choices and optional elements.

8.3 Purpose and scope of L*.methodology_goods, networks and services

This Recommendation aims to provide methodology for evaluating the environmental impact of ICT goods, networks and services objectively and transparently, which is based upon the LCA that has been standardized in the [ISO 14040] and [ISO 14044].

The purposes of this Recommendation are:

- to provide methodological framework on assessing environmental impact of ICT goods, networks and services for the whole life cycle;
- to provide life cycle inventory analysis procedure for ICT goods, networks and services with credibility;
- to provide how to interpret LCA studies on ICT goods, networks and services with transparency;
- to provide how to report the results of LCA to facilitate communication fairly and transparently.

For these purposes, [ISO 14040] and [ISO 14044] are recognized as normative references in this Recommendation.

The comparison of impacts between two situations implies the assessment of environmental impacts in other relevant sectors, therefore needs input from other relevant sectors will be considered in L*.methodology_ICT goods, networks and services.

Direct comparisons of results between different assessments are beyond the scope of this Recommendation.

9 General presentation of L*.methodology_ICT in organizations

9.1 Introduction

An effective strategy for the organization of energy management should include opportunities that lead to customer satisfaction and opportunities that create good-will on a social responsibility level. This Recommendation will target organizations to assist them in carrying forward programmes needed to address these opportunities and meet the challenge of higher energy prices and societal demands for a low-carbon economy.

This Recommendation provides Recommendations that include:

- The assessment of the environmental impact of ICT goods, networks and services produced, used and marketed by the organization.
- How to interpret the organizational impacts evaluated with the methodology on ICT goods, networks and services with transparency.
- How to report impacts at organizational level to facilitate communication fairly and transparently.

It is intended that this Recommendation will leverage the existing ICT industry expertise, R&D, and initiatives:

- by using metrics described in the Recommendations for goods, networks and services;
- by helping organizations to define or refine their energy and GHG management strategy aiming at demonstrating continuous improvements.

9.2 Summary of existing standards and methodologies

Different scopes are usually examined: direct emissions resulting from the activity, indirect emissions resulting from the usage of energy produced elsewhere and used within an organization's premises, and all other indirect emissions.

[ISO 14064-1] provides specification with guidance at the organization level for the quantification and reporting of greenhouse gases emissions and removals.

[ISO 14064-3] provides specification for the validation and verification of greenhouse gases assertions.

The GHG protocol Recommendations are also being used frequently for this type of carbon footprint assessment.

9.3 Purpose and scope of L*.methodology_ICT in organizations

This Recommendation will provide methodology to assess energy consumption and GHG emissions of ICT within organizations, over a certain period of time, for instance one year.

This Recommendation will also provide guidance on how to report the assessed impact of ICT GHG mitigation or energy saving activities carried out or planned within an organization.

L*.methodology_ICT projects will describe how to assess positive and negative impacts of an ICT project within one or more organizations.

It should be noted that the evolution of impacts of ICT projects within an organization may be assessed over several periods of time, for instance several years.

L*.methodology_ICT in organizations will specify principles, concepts, requirements and methods with guidance for quantifying, reporting and verifying GHG emissions and removals of ICT within organizations in compliance with [ISO 14064-1]. It will also include the design, development and management of a GHG inventory related to ICT within an organization. It will specifically meet the scopes defined for:

- Basic principles
- GHG inventory design and development
- GHG inventory components
- GHG inventory quality management
- GHG accounting result reporting
- Organization's role in verification activities.

10 General presentation of L*.methodology_ICT projects

10.1 Introduction

A standardized approach for quantification, monitoring and reporting is required for GHG projects and any resulting GHG emission reductions and/or removal enhancements, so that they are comparable among intended users and GHG programmes. This Recommendation intends to provide a relevant standard to implement GHG projects, in the ICT sector as well as in other sectors, which is called the ICT projects.

An ICT project is defined either as a GHG project using mainly ICT goods, networks and services, aiming at GHG emission reductions, GHG removal enhancements or a project using mainly ICT goods, networks and services, aiming at energy consumption savings and energy efficiency improvements.

A GHG project [ISO 14064-2] is defined as an activity or activities that alter the conditions identified in the baseline scenario which cause GHG emission reductions or GHG removal enhancements.

With regard to ICT activities for GHG emission reduction and removal enhancements, there are three relevant GHG accounting recognized methodologies: [ISO 14064-2], GHG protocol for project accounting and UNFCCC CDM methodologies[1].

The GHG protocol, a partnership between the World Business Council for Sustainable Development and the World Resources Institute, and [ISO 14064-2] generally have specified principles, concepts, requirements and methods with guidance for quantifying, monitoring and reporting GHG emission reductions or removal enhancements from GHG projects. They are business- or industry-neutral accounting methodologies for GHG projects. These two methodologies may be used for GHG projects supporting domestically tradable emission allowances.

[1] Only the UNFCCC maintains CDM methodologies for GHG projects supporting internationally tradable emission allowances according to the Kyoto mechanisms.

This Recommendation follows [ISO 14064-2] as its base standard and describes specific guidance for ICT projects. It describes:

- what ICT projects are;
- how an ICT project proceeds procedurally;
- what principles shall be applied to ICT projects;
- what kinds of issues an ICT project has to consider for its project planning phase;
- how an ICT project plan is validated and how the achievement results of the ICT project are verified;
- how ICT project activities are monitored in terms of GHG emissions and baseline parameters;
- how the achievement results of an ICT project are quantified;
- how the achievement results of an ICT project are reported to the relevant authorities; and
- a case study for ICT project accounting is given.

10.2 Summary of existing standards

[ISO 14064-2] focuses on GHG projects or project-based activities specifically designed to reduce GHG emissions or increase GHG removals. It includes principles and requirements for determining project baseline scenarios and for monitoring, quantifying and reporting project performance relative to the baseline scenario. It provides the basis for GHG projects to be validated and verified.

[ISO 14064-2] does not specify requirements for validation/verification bodies or validators/verifiers in providing assurance against GHG assertions or claims by GHG projects. Such requirements may be specified by the authority of the applicable GHG programme or can be found in [ISO 14064-3]. The process to recognize certified GHG emission reductions or removal enhancements as GHG units, credits or offsets is an extension of the GHG project cycle. The certification and crediting process, which may be under the authority of a GHG programme and may vary among GHG programmes, is also not included in the specifications of [ISO 14064-2].

[ISO 14064-2] deals also with the concept of additionality by requiring that the GHG project results in GHG emission reductions or removal enhancements in addition to what would have happened in the absence of that project.

10.3 Purpose and scope of L*.methodology_ICT projects

This Recommendation is specified to account for the amount of energy consumption or GHG emissions reduction and removal enhancements from an ICT project. This Recommendation specifies principles, concepts, requirements and methods with guidance for quantifying, monitoring and reporting GHG emission reductions or removal enhancements from an ICT project in compliance with [ISO 14064-2]. This Recommendation provides requirements and guidance for:

- planning an ICT project and its baseline scenario, taking into account GHG impacts;
- identifying and selecting GHG sources, sinks and reservoirs relevant to the ICT project and baseline scenario;
- managing data quality related to GHG impacts;
- monitoring, quantifying, documenting and reporting ICT project performance; and
- validating and/or verifying the ICT project plan or report.

The comparison of impacts between an ICT project and its baseline scenario may imply the assessment of environmental impacts in other relevant sectors, therefore may need input from other relevant sectors.

11 General presentation of L*.methodology_ICT in cities

11.1 Introduction

This Recommendation will present general principles on how to evaluate the environmental impacts of ICT in cities or some other administrative level, and will evaluate how ICT may reduce the rate of GHG accumulation in the atmosphere by reducing demand for energy and to conserve a variety of primary resources including fossil fuels.

ICT can have an important role in greening urban development. For example, smart buildings and smart grids can create greater energy efficiency. Intelligent transport systems including electric vehicles, harbour and airport infrastructure make transport more energy efficient. Multimedia conferencing systems and teleworking technologies can reduce travel and its carbon footprint. Cities have a high potential for eco-living due to local facilities, public transport links, dense housing and shared public resources.

The purpose of this Recommendation is to provide a methodology which accounts for the impacts of ICT in cities. It can be used to support cross-sector carbon reporting initiatives within the jurisdiction of a city as described in UNEP's "Draft International Standard for Determining Greenhouse Gas Emissions for Cities (23 March 2010)".

11.2 Summary of existing methodologies

The European Green City Index – which "measures and rates the environmental performance of 30 leading cities from 30 European countries, as well as their commitment to reducing their environmental impact" evaluates 30 cities in eight categories: CO2 emissions, energy, buildings, transportation, water and air quality, waste and land use and finally environmental governance" but it does not quantify or represent the role of ICTs in enabling reductions in these areas.

The UN Environment Programme (UNEP), UN Human Settlements Programme (UN-HABITAT) and the World Bank jointly launched on 3 March 2010 the Global Greenhouse Gas Standard for cities at the World Urban Forum in Rio de Janeiro, creating an open, global and harmonized protocol for quantifying the GHG emissions attributable to cities and local regions. This common system of calculating the amount of greenhouse gases produced in a given city and by specific sector or time, allows cities to compare their performances and analyse differences.

11.3 Purpose and scope of L*.methodology_ICT in cities

The purpose of this Recommendation is to provide a methodology which accounts for the positive and negative impacts of ICTs in cities.

ICT can be an important modulator of the overall GHG emissions attributable to a city. However, there is a risk of double accounting because ICT does not directly produce GHGs during the use phase.

Within the scope of ICT, there are four areas to be considered from a perspective of reducing GHG impact of cities. These are:

- Energy savings which can be made using new generations of ICT (e.g., standby modes, auto power down, etc.).
- Reduction of upstream supply chain GHG emissions. Examples of how this can be quantified with reference to a city will be described in this Recommendation.
- ICT may be used to reduce the environmental impact of GHGs in other sectors. This can include sustainable urban infrastructure like airports, harbours, buildings, public administration, sports venues, transport, street lighting, water management and security systems.

- Where ICT can be used to generate and efficiently route electricity, e.g., solar, wind, water the CO2 benefit will be highlighted and the method of quantification of the environmental impact of ICT will be described.

12 General presentation of L*.methodology_ICT in countries

12.1 Introduction

ICT can have an important role in sustainable development.

This Recommendation will present general principles on how to evaluate the environmental impacts of ICT in countries or group of countries and will evaluate how ICT may reduce the rate of GHG accumulation in the atmosphere by reducing demand for energy and to conserve scarce resources such as fossil fuels.

12.2 Summary of existing methodologies

This clause focuses on existing standards and methodologies as far as GHG emissions and removals are concerned.

The UNFCCC notes that "The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions. These amount to an average of five per cent against 1990 levels over the five-year period 2008-2012"…"Under the Treaty, countries must meet their targets primarily through national measures. However, the Kyoto Protocol offers them an additional means of meeting their targets by way of three market-based mechanisms. The Kyoto mechanisms are: Emissions trading – known as "the carbon market", Clean development mechanism (CDM) and Joint implementation (JI). These mechanisms help stimulate green investment and help Parties meet their emission targets in a cost-effective way."

"The IPCC has generated a number of methodology reports on national greenhouse gas inventories with a view to providing internationally acceptable inventory methodologies. The IPCC accepts the responsibility to provide scientific and technical advice on specific questions related to those inventory methods and practices that are contained in these reports, or at the request of the UNFCCC in accordance with established IPCC procedures. The IPCC has set up the Task Force on Inventories (TFI) to run the National Greenhouse Gas Inventory Programme (NGGIP) to produce this methodological advice. Parties to the UNFCCC have agreed to use the IPCC Guidelines in reporting to the convention."

"The IPCC NGGIP follows IPCC procedures and inventory methodology reports are prepared in accordance with the decision of the IPCC. When preparing inventory methodological reports, authors review the latest science and technological knowledge for the best methodologies. These are then described in the methodology report which is reviewed once by experts and the second time by governments and experts before adoption/acceptance by the IPCC."

It should be noted that the IPCC does not limit specific methodologies to be used, but rather where a better national method is available for a specific sector the IPCC recommends it be used. The only requirement is that these national methods should be transparent and documented.

Limitations

Since ICT do not emit directly GHGs during their use phase, they are not identified in UNFCCC "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories (following incorporation of the provisions of decision 13/CP.9)" as a sector for GHG reporting. Their use is included in the energy sector reports.

12.3 Purpose and scope of L*.methodology_ICT in countries

The purpose of this Recommendation is to provide a method of GHG emission reporting which accounts for the positive and negative impacts of ICT in countries or group of countries and align with relevant initiatives concerning GHG emissions.

ICT can be an important modulator of the overall GHG emissions attributable to a country. However, there is a risk of double accounting because ICT does not directly produce GHGs during the use phase.

Within the scope of ICT, there are four areas to be considered from a perspective of reducing GHG impact. These are:

- Energy savings which can be made using new generations of ICT (e.g., standby modes).
- Reduction of upstream supply chain GHG emissions. Examples of how this can be quantified will be described in this Recommendation.
- ICT may be used to reduce the environmental impact of GHGs in other sectors (e.g., by adopting electronic working methods). Such applications will be described in this Recommendation together with an indication of the possible savings.
- Where ICT can be used to generate electricity, e.g., solar panels embedded in mobile phones, the CO2 benefit will be highlighted and the method of quantification of the environmental impact will be described.

Appendix I

Information on ICT sector

(This appendix does not form an integral part of this Recommendation.)

At its May 2006 meeting, the Working Party on Indicators for the Information Society (WPIIS) of OECD invited volunteers to join an Expert Group to assist with development work on the ICT classifications, including the sector definitions on the ICT sector and the content and media sector.

The sector definitions provided by the WPIIS are based on the International Standard Industry Classification (ISIC) and the codes and titles were checked against the final (November 2008) version of ISIC Rev. 4. The WPIIS classified the ICT sector into four industries and some elements for them are provided below.

The original text is available in "Guide to Measuring the Information Society 2009" which can be found at www.oecd.org/sti/measuring-infoeconomy/guide

- ICT manufacturing industries
  - Manufacture of electronic components and boards
  - Manufacture of computers and peripheral equipment
  - Manufacture of communication equipment
  - Manufacture of consumer electronics
  - Manufacture of magnetic and optical media.
- ICT trade industries
  - ICT wholesale
    - Wholesale of computers, computer peripheral equipment and software
    - Wholesale of electronic and telecommunications equipment and parts.
- ICT services industries
  - Software publishing (only systems software and relevant application software)
  - Telecommunications
    - Wired telecommunications activities
    - Wireless telecommunications activities
    - Satellite telecommunications activities
    - Other telecommunications activities
  - Computer programing, consultancy and related activities
    - Computer programing activities
    - Computer consultancy and computer facilities management activities
    - Other information technology and computer service activities.
  - Data processing, hosting and related activities; web portals
    - Data processing, hosting and related activities
    - Web portals.
- ICT repair industries
  - Repair of computers and communication equipment;
    - Repair of computers and peripheral equipment
    - Repair of communication equipment.

The WPIIS classified the content and media sector into five industries and some elements are as follows:

- Publishing of books, periodicals and other publishing activities
  - Book publishing
  - Publishing of directories and mailing lists
  - Publishing of newspapers, journals and periodicals
  - Other publishing activities.
- Motion picture, video and television programme activities
  - Motion picture, video and television programme production activities
  - Motion picture, video and television programme post-production activities
  - Motion picture, video and television programme distribution activities
  - Motion picture projection activities.
- Sound recording and music publishing activities
- Programming and broadcasting activities
  - Radio broadcasting
  - Television programming and broadcasting activities.
- Other information service activities
  - News agency activities
  - Other information service activities.

Appendix II

Numbering of Recommendations on methodologies

(This appendix does not form an integral part of this Recommendation.)

Recommendation ITU-T L.1400: Recommendation on methodology, general umbrella (this Recommendation)

Recommendation ITU-T L.1410: Recommendation on methodology to assess environmental impacts of ICT goods, networks and services

Recommendation ITU-T L.1420: Recommendation on methodology to assess environmental impacts of ICT in organizations

Recommendation ITU-T L.1430: Recommendation on methodology to assess environmental impacts of ICT projects

Recommendation ITU-T L.1440: Recommendation on methodology to assess environmental impacts of ICT in cities

Recommendation ITU-T L.1450: Recommendation on methodology to assess environmental impacts of ICT in countries

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- Deliverable 1: Definitions
- Deliverable 2: Gap Analysis and Standards Roadmap
- Deliverable 3: Methodologies
- Deliverable 4: Direct and Indirect Impact of ITU Standards

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