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OUTSIDE PLANT

**Methodology for assessment of the
environmental impact of information and
communication technology greenhouse gas and
energy projects**

Recommendation ITU-T L.1430



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Methodology for assessment of the environmental impact of information and communication technology greenhouse gas and energy projects

Summary

Recommendation ITU-T L.1430 is intended as a complement to ISO standard ISO 14064-2 and the Project Protocol of the Greenhouse Gas Protocol (GHG Protocol).

This Recommendation provides guidance for the application of a specific methodology to assess the environmental impact of information and communication technology (ICT) greenhouse gas (GHG) and energy projects. This assessment methodology is specifically directed at quantifying and reporting GHG emission reductions, GHG removal enhancements, energy consumption reductions, and enhancement of energy generation and storage in ICT GHG and energy projects.

An ICT GHG project uses mainly ICT goods, networks and services (GNS) and is designed to reduce GHG emissions or increase GHG removals that are quantified by comparison between the environmental impact of a project activity and a corresponding baseline scenario.

An ICT energy project uses mainly ICT goods, networks and services to reduce energy consumption and improve energy efficiency.

From the ICT perspective, this Recommendation takes into account considerations based on existing project quantification guidelines and aims at covering ICT GHG and energy project activities within both the ICT and the non-ICT sectors.

This Recommendation recognizes the importance of project validation and verification for the credibility of project results but does not enforce the validation and verification procedures to be applied. It is expected that such procedures will be determined by the selected GHG programme, national regulations, the project proponent's internal policy or the intended user's request.

History

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Table of Contents

	Page
1 Scope	1
2 References.....	1
3 Definitions	2
3.1 Terms defined elsewhere	2
3.2 Terms defined in this Recommendation.....	3
4 Abbreviations and acronyms	7
5 Conventions	7
6 Principles of assessment of ICT GHG and ICT energy projects	7
6.1 Relevance	8
6.2 Completeness.....	8
6.3 Consistency.....	8
6.4 Accuracy.....	8
6.5 Transparency	8
6.6 Conservativeness	8
7 Introduction to ICT GHG and energy projects	8
7.1 ICT GHG and energy projects.....	8
7.2 Adoption of a GHG programme.....	10
7.3 Quantification units and emission factors	11
7.4 Consideration of life cycle assessment.....	11
7.5 Project cycle of an ICT GHG/energy project	12
8 Planning of ICT GHG and ICT energy projects.....	12
8.1 General requirements.....	12
8.2 Defining the boundary for assessment of an ICT GHG/energy project	12
8.3 Determining the baseline scenario of the ICT GHG project or ICT energy project	13
8.4 Designing data quality management	16
8.5 Describing an ICT GHG project or ICT energy project.....	17
9 Validation of an ICT GHG or ICT energy project	18
10 Project monitoring of an ICT GHG or ICT energy project	18
11 Quantification of an ICT GHG or ICT energy project	19
11.1 Requirements.....	19
11.2 Guidance for quantifying GHG and energy effects.....	19
12 Reporting on an ICT GHG project or ICT energy project.....	22
12.1 Requirements	22
13 Verification of an ICT GHG project or ICT energy project.....	25
Appendix I – Examples of information and communication technology (ICT) greenhouse gas and energy projects.....	26

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	Page
Appendix II – Documentation form for the project plan of ICT GHG and energy projects ...	30
Appendix III – Description of project cycle and steps.....	33
III.1 Planning phase steps.....	33
III.2 Implementation phase steps.....	33
Appendix IV – Consideration of emission avoidance	35
Appendix V – Consideration of unintended changes in GHG effects and energy effects.....	37
V.1 One-time unintended changes	37
V.2 Unintended upstream and downstream changes.....	37
V.3 Analysis of market responses to upstream and downstream effects	38
V.4 Assessment of significance of unintended changes.....	38
Appendix VI – Guidance for reporting on ICT GHG projects and ICT energy projects	40
VI.1 General guidance	40
VI.2 Guidance for describing assessment boundary.....	40
VI.3 Guidance for describing baseline scenarios	40
VI.4 Guidance for describing estimated baseline impact	40
VI.5 Guidance for describing the monitoring plan.....	40
VI.6 Guidance for describing project impact	41
VI.7 Guidance for describing GHG and energy assertions	41
VI.8 Guidance for describing validation and verification statement.....	41
Bibliography.....	42

Recommendation ITU-T L.1430

Methodology for assessment of the environmental impact of information and communication technology greenhouse gas and energy projects

1 Scope

This Recommendation describes principles, concepts, requirements and methods to provide specific guidance for assessment of the environmental impact of information and communication technology (ICT) greenhouse gas (GHG) projects and ICT energy projects. The methodology has been developed from the ICT perspective and is intended to assist in quantifying, monitoring and reporting GHG emission reductions or removal enhancements, energy consumption reductions, and enhancements of energy generation and storage in ICT GHG and ICT energy projects.

This Recommendation is a complement to [ISO 14064-2] and [b-Project Protocol] and provides additional requirements and guidance to complement [ITU-T L.1410] in:

- identifying GHG sources, sinks and storage systems relevant to ICT GHG projects
- identifying energy consumers, generators and storage systems relevant to ICT energy projects
- determining the baseline scenario
- identifying GHG sources, sinks and storage systems relevant to the baseline scenario
- identifying energy consumers, generators and storage systems relevant to the baseline scenario
- selecting relevant GHG sources, sinks and storage systems as well as relevant energy consumers, generators and storage systems for monitoring or estimating GHG and energy effects
- quantifying GHG emissions and removals as well as energy consumptions
- quantifying GHG emission reductions and removal enhancements as well as energy consumption reductions, and energy generation and energy storage enhancements
- managing data quality
- monitoring ICT GHG and energy projects
- documenting ICT GHG and energy projects
- validating and verifying ICT GHG and energy projects
- reporting on ICT GHG and energy projects.

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] ITU-T L.1410 (2012), *Methodology for the assessment of the environmental impact of information and communication technology goods, networks and services*.

[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.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 carbon dioxide equivalent (CO₂e) [ISO 14064-2]: A unit for comparing the radiative forcing of a GHG to carbon dioxide.

NOTE – The carbon dioxide equivalent is calculated using the mass of a given GHG multiplied by its global warming potential.

3.1.2 environmental load [ITU-T L.1410]: Environmental aspect which potentially causes interference with environmental conservation.

3.1.3 first order effects [ITU-T L.1410]: The impact created by the physical existence of ICTs and the processes involved, e.g., GHG emissions, e-waste, use of hazardous substances and use of scarce, non-renewable resources.

3.1.4 global warming potential (GWP) [ISO 14064-2]: Factor describing the radiative forcing impact of one mass-based unit of a given GHG relative to an equivalent unit of carbon dioxide over a given period of time.

3.1.5 greenhouse gas (GHG) [ISO 14064-2]: 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 – GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆) and additionally Nitrogen Trifluoride (NF₃).

3.1.6 greenhouse gas (GHG) emission [ISO 14064-2]: Total mass of a GHG released to the atmosphere over a specified period of time.

3.1.7 greenhouse gas (GHG) emission reduction [ISO 14064-2]: A calculated decrease of GHG emissions between a baseline scenario and the project.

NOTE – The GHG emission reduction covers either decreases in relation to a hypothetical reference case or in relation to a real reference case as defined by the baseline scenario. Appendix IV includes more information.

3.1.8 greenhouse gas (GHG) removal [ISO 14064-2]: Total mass of a GHG removed from the atmosphere over a specified period of time.

3.1.9 greenhouse gas (GHG) sink [ISO 14064-2]: The physical unit or process that removes a GHG from the atmosphere.

3.1.10 greenhouse gas (GHG) source [ISO 14064-2]: The physical unit or process that releases a GHG into the atmosphere.

3.1.11 intended user [ISO 14064-2]: An individual or organization identified by those reporting GHG-related information as being the one who relies on that information to make decisions.

NOTE – The intended user can be the client, the responsible party, GHG programme administrators, regulators, the financial community or other affected stakeholders, such as local communities, government departments or non-governmental organizations.

3.1.12 monitoring [ISO 14064-2]: A continuous or periodic assessment of GHG emissions and removals or other GHG-related data.

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

3.1.14 stakeholder [ISO 14064-2]: An individual or organization that is affected by the development or implementation of a greenhouse gas project.

3.1.15 uncertainty [ISO 14064-2]: The parameter associated with the result of quantification which characterizes the dispersion of the values that could be reasonably attributed to the quantified amount.

NOTE – Uncertain information typically specifies quantitative estimates of the likely dispersion of values and a qualitative description of the likely causes of the dispersion.

3.1.16 validation [ISO 14064-2]: A systematic, independent and documented process for the evaluation of a greenhouse gas assertion in a GHG project plan against agreed validation criteria.

NOTE 1 – In some cases, such as in first-party validations, independence can be demonstrated by the freedom from responsibility for the development of GHG data and information.

NOTE 2 – The content of a GHG project plan is described in clause 7.1.

3.1.17 validator [ISO 14064-2]: Competent and independent person or persons with responsibility for performing and reporting on the results of a validation.

NOTE – This term can be used to refer to a validation body.

3.1.18 verification [ISO 14064-2]: A systematic, independent and documented process for the evaluation of a greenhouse gas assertion against agreed verification criteria.

NOTE – In some cases, such as in first-party verifications, independence can be demonstrated by the freedom from responsibility for the development of GHG data and information.

3.1.19 verifier [ISO 14064-2]: Competent and independent person, or persons, with responsibility for performing and reporting on the verification process.

NOTE – This term can be used to refer to a verification body.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 alternative baseline scenarios: Alternative technologies or practices within a specified geographic area and temporal range that could provide the same product or service as the project.

3.2.2 barrier: Any factor or consideration that would significantly discourage a decision to try to implement the project activity or its alternative baseline scenarios.

3.2.3 baseline impact: An estimated amount of GHG and energy effects associated with a baseline scenario or derived using a reference emission factor.

NOTE – A negative number for a baseline impact means that GHG removals are greater than GHG emissions; and energy consumption reductions, energy generation and energy storage enhancements are greater than energy consumptions.

3.2.4 baseline parameter: Any parameter whose value or status can be monitored in order to validate assumptions about baseline impact estimates or help to estimate baseline impacts.

3.2.5 baseline procedure: A method used to estimate baseline impacts.

3.2.6 baseline scenario: Either a hypothetical reference case that best represents the conditions most likely to occur in the absence of a proposed ICT GHG and/or energy project, or a real reference case where emissions are being generated and can be reduced by a proposed ICT GHG and/or ICT energy project (e.g., GHG emissions caused by an employee's business travel can be reduced by an ICT GHG and/or ICT energy project which includes video conference facilities).

NOTE 1 – The assessed time period of the baseline scenario concurs with that of the ICT GHG project/ or ICT energy project.

NOTE 2 – Appendix IV provides additional information.

3.2.7 emission factor: A factor linking GHG emissions to a level of activity or a certain quantity of inputs, products or services (e.g., tonnes of fuel consumed or units of a product).

NOTE – An electricity emission factor is commonly expressed as tonnes of CO₂e per MWh. For example, an electricity emission factor of 1.3 means 1.3 t CO₂e is emitted by consuming 1 MWh of electricity.

3.2.8 energy assertion: A declaration or factual and objective statement on the energy effects of project impacts, made by the responsible party.

NOTE 1 – The energy assertion may be presented in time scale or may cover a period of time.

NOTE 2 – The energy assertion provided by the responsible party should be clearly identifiable and allow consistent evaluation or measurement against suitable criteria by a validator or verifier.

NOTE 3 – The energy assertion could be provided in the form of an energy report or project plans of a GHG project, an ICT GHG project or an ICT energy project.

3.2.9 energy consumer: The physical unit or process that consumes energy.

3.2.10 energy consumption reduction: The decrease in energy consumption that is calculated between a baseline scenario and the project.

3.2.11 energy effect: The impact of energy consumption, energy consumption reductions and energy generation and energy storage enhancements on energy consumers, energy generators and energy storage.

3.2.12 energy generated: The calculated increase of the amount of energy generated by an energy generator between a baseline scenario and the project.

3.2.13 energy generator: The physical unit or process that generates energy.

3.2.14 energy storage system: The physical unit or component that has the capability to store or accumulate energy produced by an energy generator or energy captured from an energy consumer.

3.2.15 energy stored: The calculated increase of the amount of energy stored in an energy storage system between a baseline scenario and the project.

3.2.16 energy unit: The unit used for energy quantification. Energy units are expressed for electricity in MWh and for other energy types in tonne of oil equivalent (TOE).

NOTE – Energy units for an ICT GHG project or an ICT energy project may be converted to GHG units which may finally be represented by a certified emission reduction (CER), an emission reduction unit (ERU), credits or offsets, depending on the chosen GHG programme.

3.2.17 environmental load of an ICT [based on ITU-T L.1410]: The environmental load of an ICT over its life cycle. This includes the environmental load of ICT goods, networks and services (GNS) in the processes of a life cycle assessment (LCA), i.e., raw material acquisition, production, use and end-of-life treatment.

3.2.18 environmental load reduction effect from using ICTs [based on ITU-T L.1410]: The effect that noticeably reduces the environmental load of ICTs. The effects of improving energy efficiency, improving the efficiency of and reducing the production and consumption of goods, and reducing the movement of people and goods are brought about by using ICTs.

3.2.19 geographic area: A physical area that defines the analysis boundary of the baseline scenario, the alternative baseline scenarios and the project scenario. The area can be defined by a number of different elements including sociocultural, economic or legal factors, and the availability of the necessary physical infrastructure and biophysical characteristics.

3.2.20 greenhouse gas (GHG) assertion: A declaration or factual and objective statement on GHG effects of project impacts, made by the responsible party.

NOTE 1 – The GHG assertion may be presented in time scale or may cover a period of time.

NOTE 2 – The GHG assertion provided by the responsible party should be clearly identifiable and able to be consistently evaluated or measured against suitable criteria by a validator or verifier.

NOTE 3 – The energy assertion could be provided in the form of an energy report or project plans of a GHG project, an ICT GHG project or an ICT energy project.

3.2.21 greenhouse gas (GHG) effect: The consequence related to GHG emissions, removals, reductions and removal enhancements for GHG sources, sinks and storage devices.

3.2.22 greenhouse gas (GHG) programme: A generic term for: (1) any voluntary, mandatory, governmental or non-governmental initiative, system or programme that registers, certifies or regulates GHG emissions; or (2) any authorities responsible for developing or administering such initiatives, systems or programmes.

3.2.23 greenhouse gas (GHG) removal enhancement: A calculated increase in GHG removals between the baseline scenario and the project scenario.

NOTE – GHG removal enhancement corresponds to quantified GHG removal achieved by a project activity or set of project activities intended for the capture and storage of GHG. The use of ICT may enhance some GHG removals.

3.2.24 greenhouse gas (GHG) storage system: A physical unit or component of the biosphere, geosphere or hydrosphere with the capability to store or accumulate a GHG removed from the atmosphere by a greenhouse gas sink or a GHG captured from a greenhouse gas source.

NOTE 1 – The total mass of carbon contained in a GHG storage system at a specified point in time could be referred to as the carbon stock of the storage.

NOTE 2 – A GHG storage system can transfer greenhouse gases to another GHG storage system.

NOTE 3 – The capture of a GHG from a GHG source before it enters the atmosphere and its storage in a GHG storage system could be referred to as GHG capture and storage.

3.2.25 greenhouse gas (GHG) unit: A unit used for GHG quantification. GHG units are expressed in tonnes of CO₂e.

NOTE – GHG units for GHG projects and ICT GHG projects may be represented by certified emission reduction (CER), emission reduction unit (ERU), credits and offsets according to the chosen GHG programme.

3.2.26 host participant: The participant on whose territory a project activity is physically located. A project activity located in several places may have several host participants.

3.2.27 ICT energy project plan: A document that describes the implementation plan of an ICT energy project.

3.2.28 ICT GHG project plan: A document that describes the implementation plan of an ICT GHG project.

3.2.29 ICT project activity: A project activity that incorporates mainly ICT goods, networks and services (GNS).

3.2.30 information and communication technology (ICT) project: 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.

3.2.31 information and communication technology (ICT) energy project: An ICT project that is designed to reduce energy consumption or enhance generation or storage of energy.

3.2.32 information and communication technology (ICT) greenhouse gas (GHG) project: An ICT project that is designed to reduce GHG emissions or increase GHG removals.

3.2.33 market response: A positive or negative reaction to a change in GHG emissions or energy consumptions as a result of project activity that affects market supply and demand.

3.2.34 off-grid electricity: Electricity not connected to the power grid.

3.2.35 one-time unintended changes: Unintended changes in GHG and energy effects related to the construction, installation and establishment of a project activity, or its decommissioning and termination.

3.2.36 other effects: [based on ITU-T L.1410] Effects that are not first or second order effects.

NOTE – Other effects may include the impacts and opportunities created by the aggregated effects on societal structural changes as a result of using ICTs. For some ICT services, such as teleworking or video conferencing, such effects may include the time gained by an end user using an ICT service which may then cause an additional impact e.g., a leisurely drive and economic activities, which are difficult to track. Such additional impacts are often defined as "rebound effects".

3.2.37 project activity: Any activity performed in a project which directly changes GHG emissions, removals or storage, energy consumptions, energy consumption reductions, energy generation or energy storage enhancements.

NOTE – The project activity may include modifications or alterations to an existing production, process, consumption, service, or management system, as well as the introduction of new systems. Activities related to management of the project are not considered as project activities in this Recommendation.

3.2.38 project activity impact: A quantified amount of GHG and energy effects produced by a project activity.

NOTE – The values of project activity impacts may be intermediate values issued by intermediate reports.

3.2.39 project impact: A quantified amount of GHG and energy effects produced by an ICT GHG or ICT energy project.

NOTE 1 – The values of project impacts may be intermediate values issued by intermediate reports.

NOTE 2 – A negative number for a project's impact means that GHG removals are greater than GHG emissions; and energy consumption reductions, energy generation and energy storage enhancements are greater than energy consumptions.

3.2.40 project participant: A participating organization that shares project benefits with other project participants and is either (a) an involved party that has indicated that it is a project participant, or (b) a private or public entity authorized by an involved party to participate in a project activity.

3.2.41 project plan documentation form: A documentation format to describe project activities of an ICT GHG project or an ICT energy project.

NOTE – The project plan documentation form for ICT GHG projects and ICT energy projects is specified in Appendix II.

3.2.42 project proponent: An organization that has overall control and responsibility for ICT GHG and energy projects.

3.2.43 project-specific procedure: A particular procedure to estimate baseline impacts that are based on the conditions specific to a project.

3.2.44 reference emission factor: A GHG emission factor used to determine baseline impacts for a particular type of project activity. A reference emission factor may be used to estimate baseline impacts for any number of similar project activities in the same geographic area.

3.2.45 reference emission factor procedure: A baseline procedure that estimates baseline impacts using a GHG emission factor derived from a numerical analysis of the GHG emission factors of all alternative baseline scenarios.

3.2.46 temporal range: A time period that defines the analysis boundary of the baseline scenario, the alternative baseline scenarios and the project scenario. The temporal range can be defined by a number of factors, such as the dominance of a single technology for an extended period of time, the diversity of options in a sector or region, or a discrete change in area or regional policy, technology, practice or resources.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AR	Assessment Report
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide equivalent
CSR	Corporate Social Responsibility
EoLT	End-of-Life Treatment
ERU	Emission Reduction Unit
GHG	Greenhouse Gas
GNS	Goods, Networks and Services
GWP	Global Warming Potential
ICT	Information and Communication Technology
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Assessment
QA/QC	Quality Assurance and Quality Control
tCO ₂ e	Tonne of CO ₂ equivalent
TOE	Tonne of Oil Equivalent
UNFCCC	United Nations Framework Convention on Climate Change

5 Conventions

None.

6 Principles of assessment of ICT GHG and ICT energy projects

There are six principles that shall be applied to all aspects of the quantification and reporting of GHG and energy effects in order to ensure that the information on project results is a true and fair account.

6.1 Relevance

Relevant information on GHG sources, GHG sinks, GHG storage system, energy consumers, energy generators, energy storage system, and data and methodologies appropriate to the needs of intended users shall be selected. The quantification and reporting of GHG and energy effects shall thus include the information that intended users – both internal and external to an ICT GHG project or ICT energy project – need for their decision making and other purposes, such as internal and external communication. This information should fit the intended purpose of an ICT GHG project or ICT energy project and meet the expectations or requirements of intended users.

6.2 Completeness

All relevant GHG and energy effects shall be included, and all relevant information that may affect their quantification shall be considered and assessed. All relevant technologies or practices shall be considered as alternative baseline scenarios, and all relevant alternative baseline scenarios shall be considered when estimating baseline impacts.

6.3 Consistency

GHG and energy-related information, data, methodologies, criteria and assumptions shall allow meaningful and valid comparisons. To meet this objective:

- the same methodologies and procedures shall be applied to either an ICT GHG project or an ICT energy project and their components shall be applied in the same manner; and
- the same criteria and assumptions shall be used, and any data collected and reported shall be sufficiently compatible to allow meaningful and valid comparisons over time.

6.4 Accuracy

Bias and uncertainties with respect to GHG and energy measurements, estimates or calculations shall be reduced as much as possible. Acceptable levels of uncertainty will depend on the objectives of the ICT GHG project or ICT energy project in view of the needs of the intended user. If accuracy is sacrificed, data and estimates used to quantify GHG and energy effects shall be conservative.

6.5 Transparency

Sufficient and appropriate GHG- and energy-related information shall be provided to allow intended users to make decisions with reasonable confidence. For example, appropriate GHG- and energy-related information shall be compiled, analysed and documented in a clear, appropriate and coherent way that enables validators and verifiers to evaluate its credibility.

6.6 Conservativeness

The basic requirement is that GHG emission reductions, GHG removal enhancements, energy-consumption reductions, and enhancements of energy generation and energy storage related to the project shall not be overestimated. Conservative assumptions, values and procedures shall be used when data and factors are uncertain and measures to increase accuracy and reduce uncertainty are not cost-effective. Conservative quantification results will be underestimated rather than overestimated.

7 Introduction to ICT GHG and energy projects

7.1 ICT GHG and energy projects

The ICT GHG project is an ICT project which uses ICT goods, networks and services (GNS) to reduce GHG emissions, increase the capture and storage of GHG, or enhance GHG removals.

The ICT energy project is an ICT project which uses ICT goods, networks and services to reduce energy consumption and to enhance energy generation and storage.

An ICT GHG project or an ICT energy project may be implemented by any organization or company to reduce GHG emissions and energy consumptions. Both non-ICT and ICT activities may affect GHG emissions and energy consumption. For example, the establishment of a data centre may on the one hand incorporate activities for cooling and ventilation that are non-ICT activities and on the other hand include activities related to ICT goods, networks and services (GNS) systems that are ICT activities.

If an ICT GHG project or ICT energy project forms part of a general GHG project, the non-ICT-related activities of the GHG project are not addressed but are handled by existing GHG project methodologies; see [ISO 14064-2] and [b-Project Protocol].

An ICT network consists of a number of ICT goods that impact its GHG and energy effects. An ICT network incorporating various ICT goods may be used for ICT GHG and energy projects in any business or industrial sector. The ICT network itself may also be the target of such ICT GHG and energy projects.

An ICT service uses ICT goods and may also use ICT networks. Thus, the first order and second order effects of an ICT service may be analysed by assessing a combination of ICT goods and ICT networks. The ICT service itself may also be the target of ICT GHG and energy projects.

ICT GHG and energy projects may target the operational, industrial and commercial processes of ICT and other sectors where ICT goods, networks and services are installed to enhance their GHG and energy effects. Examples of ICT projects within the ICT sector are the establishment of energy-efficient networks, construction of energy-efficient base stations, establishment of a green and energy-efficient data centre, construction of optical fibre cables, installation of high performance and energy-efficient routers and switches, and installation of digital broadcasting systems. Appendix I lists other examples of ICT GHG and ICT energy projects.

Reduction of GHG emissions by ICT GHG and energy projects in non-ICT sectors may be achieved by ICT solutions which enable GHG and energy efficiency improvement in their industrial, commercial or operational processes. For example, projects related to ICT-based electricity networks (smart grids), ICT-based homes (smart homes), ICT-based buildings (smart buildings), ICT-based transportation and traffic flow, and ICT-based manufacturing processes where ICT has the potential to reduce GHG emissions and energy consumption in many different ways, including enhancements in the efficiency of the respective business process. Another example is optimized logistics for achieving better quality of service for receivers while reducing the overall driving distance and total fuel requirements. Appendix I provides more detailed information.

For quantification of first and second order effects of ICT GHG projects and ICT energy projects see clauses 11.2.3 and 11.2.4.

7.1.1 Project activities

ICT project activities are any activities which use mainly ICT GNS and are performed in an ICT project to change GHG emissions, removals or storage, energy consumptions, energy consumption reductions, energy generation or energy storage enhancements. Examples of such activities in the ICT sector are: replacement of existing ICT goods with energy-efficient ICT goods; reconfiguration of processing procedures and interconnection architectures of ICT goods, networks and services; rebuilding of software functions in ICT goods; recycling of ICT goods; virtualization of ICT goods and networks; and utilization of electric energy generated by renewable energy sources such as solar and wind power. ICT GHG and ICT energy projects may have diverse activities but their results will contribute to the improvement of the total GHG and energy effects compared to the baseline scenario.