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

Guidance for information and communication technology manufacturers on setting 1.5°C aligned targets compliant with Recommendation ITU-T L.1470

ITU-T L-series Recommendations – Supplement 38

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

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Supplement 38 to ITU-T L-series Recommendations

Guidance for information and communication technology manufacturers on setting 1.5°C aligned targets compliant with Recommendation ITU-T L.1470

Summary

Supplement 38 to ITU-T L-series Recommendations supports information and communication technology (ICT) organizations in setting science-based targets for greenhouse gases (GHGs) according to the decarbonization pathways described in detail in Recommendation ITU-T L.1470, aligned with the *Special report: Global warming of 1.5°C* by the Intergovernmental Panel on Climate Change (IPCC), and is intended for provision to the Science Based Targets Initiative (SBTi) for use as a sectoral target-setting approach. Supplement 38 to ITU-T L-series Recommendations focuses exclusively on ICT manufacturers. Guidance for additional sub-sectors, including semi-conductor manufacturers and printed circuit board (PCB) manufacturers, is for further study.

NOTE 1 – The term "ICT manufacturers" refers to organizations that have the financial and organizational control of the design and production of ICT goods, including software providers.

NOTE 2 – Guidance for ICT network and datacentre operators have earlier been published as [SBT-I 2020b] and [ITU-T L-Suppl.37].

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FOREWORD

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Guidance for information and communication technology manufacturers on setting 1.5°C aligned targets compliant with Recommendation ITU-T L.1470

1 Scope

This Supplement supports information and communication technology (ICT) companies in setting science-based targets for greenhouse gases (GHGs) according to a set of new decarbonization pathways described in detail in [ITU-T L.1470] and aligned with [IPCC 1.5] and is intended for provision to the Science Based Targets Initiative (SBTi) for use as a sectoral target-setting approach.

At the time of publication, this Supplement focuses exclusively on ICT manufacturers of networks, data centres and user devices, and supports them in setting science-based targets focusing on both their manufacturing processes and support activities.

NOTE 1 – The term "ICT manufacturers" refers to organizations that have the financial and organizational control of the design and production of ICT goods, including software providers.

NOTE 2 – Guidance for ICT network and datacentre operators have earlier been published as [SBT-I 2020b] and [ITU-T L-Suppl.37].

2 References

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3 Definitions

3.1 Terms defined elsewhere

This Supplement uses the following terms defined elsewhere:

3.1.1 end-user [ITU-T L.1470]: The actual user of the products or services.

NOTE 1 – The end-user consumes the product or service. An end-user can optionally be a subscriber.

NOTE 2 – The end-user could be either a company or a consumer.

3.1.2 ICT goods [ITU-T L.1410]: Tangible goods deriving from or making use of technologies devoted to or concerned with: the acquisition, storage, manipulation (including transformation), management, movement, control, display, switching, interchange, transmission or reception of a diversity of data; the development and use of the hardware, software, and procedures associated with this delivery; and the representation, transfer, interpretation, and processing of data among persons, places and machines.

3.1.3 ICT manufacturer [ITU-T L.1470]: Organization which has the financial and organizational control of the design and production of ICT goods.

NOTE – In line with 3.1.2 this also includes software providers.

3.1.4 ICT organization [ITU-T L.1420]: 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.

3.1.5 ICT supplier [ITU-T L.1470]: Organization that provides information and communication technology (ICT) products or services to an ICT organization.

3.1.6 operator [ITU-T L.1470]: An organization operating networks, data centres or services.

3.1.7 ICT end-user: A company or consumer which is the user of an ICT good.

3.2 Terms defined in this Supplement

None.

4 Abbreviations and acronyms

1.5DS	1.5° Scenario
2DS	2° Scenario
B2DS	Below 2° scenario
ERF	Emission Reduction Factor
GHG	Greenhouse Gas
ICT	Information and Communication Technology
PCB	Printed Circuit Board
SBT	Science-Based Target
SDA	Sectoral Decarbonization Approach
SME	Small- or Medium-sized Enterprise

5 Conventions

None.

6 Background information

6.1 Structure

This Supplement is divided into four main parts plus appendices. This clause is a general introduction. Clause 7 briefly explains the trajectories and how the target setting methodology has been developed. Clause 8 provides instructions to assist companies setting targets. Clause 9 addresses the specific aspects of scope 3 emissions, which are often the largest source of emissions for ICT manufacturers. The appendices give more detailed explanations of the underlying methodologies and additional reference material.

6.2 Practical applications

ICT organizations wishing to set a science-based target recognized by SBTi need to consider the GHG emissions associated with their internal operations including their direct emissions (scope 1) and the emissions related to the energy used for their operation (scope 2) as specified in [GHGP 2015]. In this context, if an ICT organization has value chain (scope 3) emissions over 40% of total scope 1, 2 and 3 emissions, a scope 3 target should be defined. This target should be ambitious, measurable and clearly demonstrate how the main sources of value chain GHG emissions in line with current best practice will be considered.

This Supplement supports ICT organizations in the process of setting science-based targets associated with their use of electricity to run their ICT operations (scope 2) and the use of diesel to generate electricity used to run their ICT operations (scope 1). It also supports ICT organizations in including the use of electricity, energy and fuel for support activities (including service facilities such as offices and transport fleets).

Since most ICT organizations have significant scope 3 emissions, this Supplement also gives general guidance to help ICT organizations establish scope 3 targets.

If an ICT organization has operations covered by more than one sub-sector (for example an ICT manufacturer that also produces components), this organization can split its emissions accordingly and then add the resulting sub-sector targets together to obtain a company-wide target.

Finally, it is recognized that there could be geographic differences among ICT organizations, implying differences in electricity grid factors and different availability of renewable electricity markets with robust certificates. However, in line with other sectoral target-setting approaches, no consideration is given to different geographical operations in the first edition of this Supplement.

7 Trajectories consistent with a 1.5°C scenario

7.1 Development of trajectories

This Supplement is based on [ITU-T L.1470], which, as well as the underlying methodologies and pathways, was developed by an ICT sector collaboration between the Global Enabling Sustainability Initiative (GESI), the GSM Association (GSMA), the International Telecommunications Union (ITU) and the SBTi.

The science underlying global GHG scenarios is being continuously updated. The trajectories used for this ICT sectoral target-setting approach will be reviewed as benchmarks and scenarios are updated.

7.2 ICT sub-sector trajectories

Sub-sector trajectories to 2030, consistent with a climate scenario limiting global warming to 1.5°C, have been developed in [ITU-T L.1470] for mobile network operators, fixed network operators, data centre operators, user devices and manufacturers of ICT equipment. They underpin the ICT science-based targets (SBTs) approach, and are compatible with the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement. [ITU-T L.1470] also recommends an approach to long-term ambitions for 2050.

At the start of this work, possible trajectories were considered using three separate, normative approaches:

- IPCC 1.5°C P2 scenario requiring a halving of emissions between 2015 and 2030;
- SBTi 1.5°C trajectory demanding 42% reduction over 10 years;
- a 1.5°C scenario (1.5DS), carbon budget approach based on the ICT sector maintaining a fixed share of overall electricity usage (based on [IEA ETP]).

It should be noted that the third normative approach considers the global need for electricity as outlined by the International Energy Agency (IEA) for different scenarios and develops an interim 1.5DS within which ICT should not expand its current share of electricity. This electricity budget uses the IEA trajectories for a 2°C scenario (2DS) and a below 2°C scenario (B2DS) to derive a 1.5°C trajectory for world electricity usage through doubling the difference between them and subtracting it from the 2DS as described in [IEA ETP]. This is an interim approach as IEA has not yet established a 1.5DS. The budget is then used to determine the amount of electricity that could be used by the sector if keeping its share at the current level. As the IEA is planning to include a specific 1.5DS, the trajectories will be reviewed when the new IEA scenarios are published.

The published pathways, as illustrated in the following, are consistent with the level of emission reductions determined by all three approaches.

Figure 1 summarizes the resulting 1.5°C trajectories for the ICT sector and its sub-sectors based on [ITU-T L.1470].

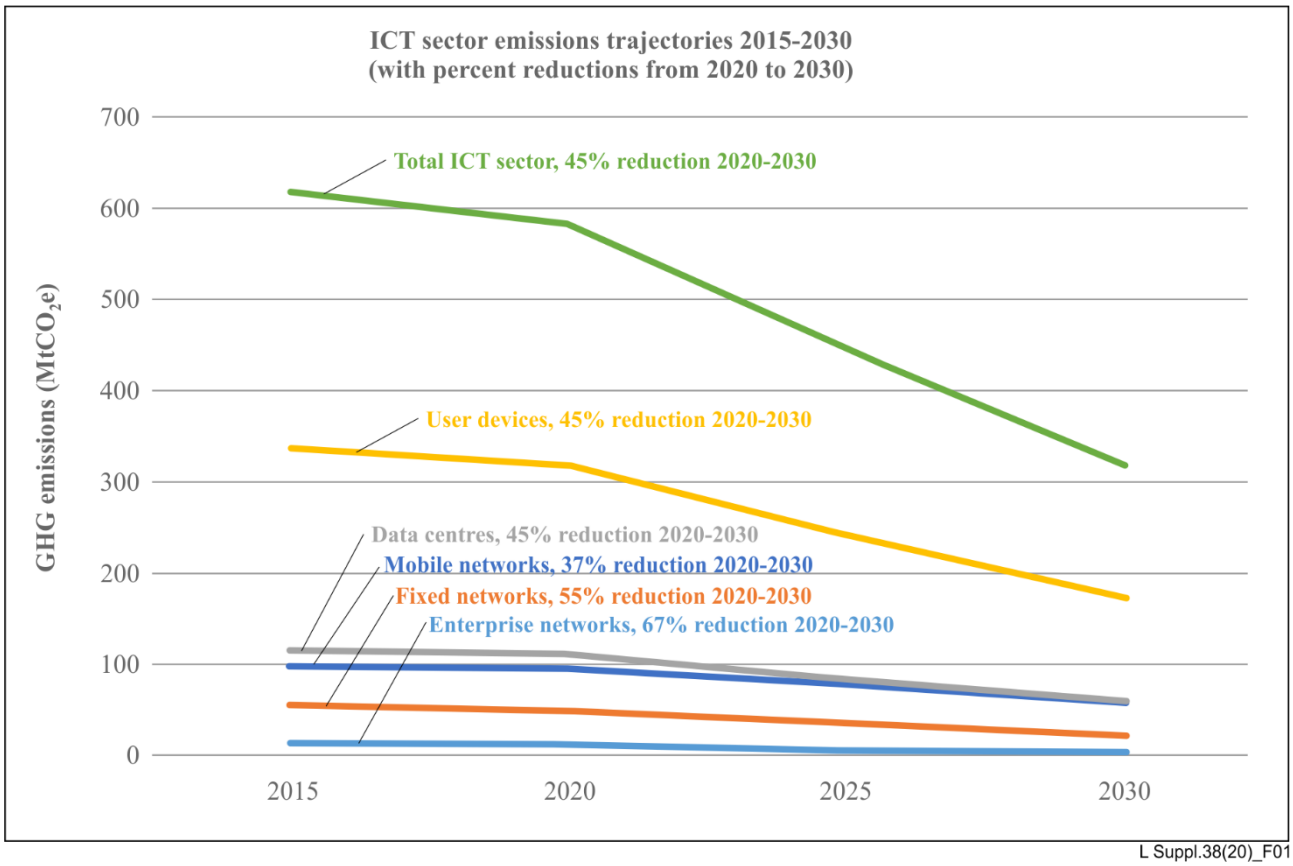

Figure 1 – Summary of ICT sector and sub-sector trajectories including embodied emissions and operation

It should be noted that Figure 1 shows ICT sector life cycle emissions from a company accounting perspective. Hence, it does not include emissions related to electricity grid losses and the electricity supply chain. Values including those are about 20% higher, as described in [ITU-T L.1470].

Figure 2 shows the trajectories for operational emissions of ICT manufacturers (i.e., company scope 1 and 2 emissions) including manufacturing activities and the supporting activities of these companies. These trajectories exclude scope 3 emissions.

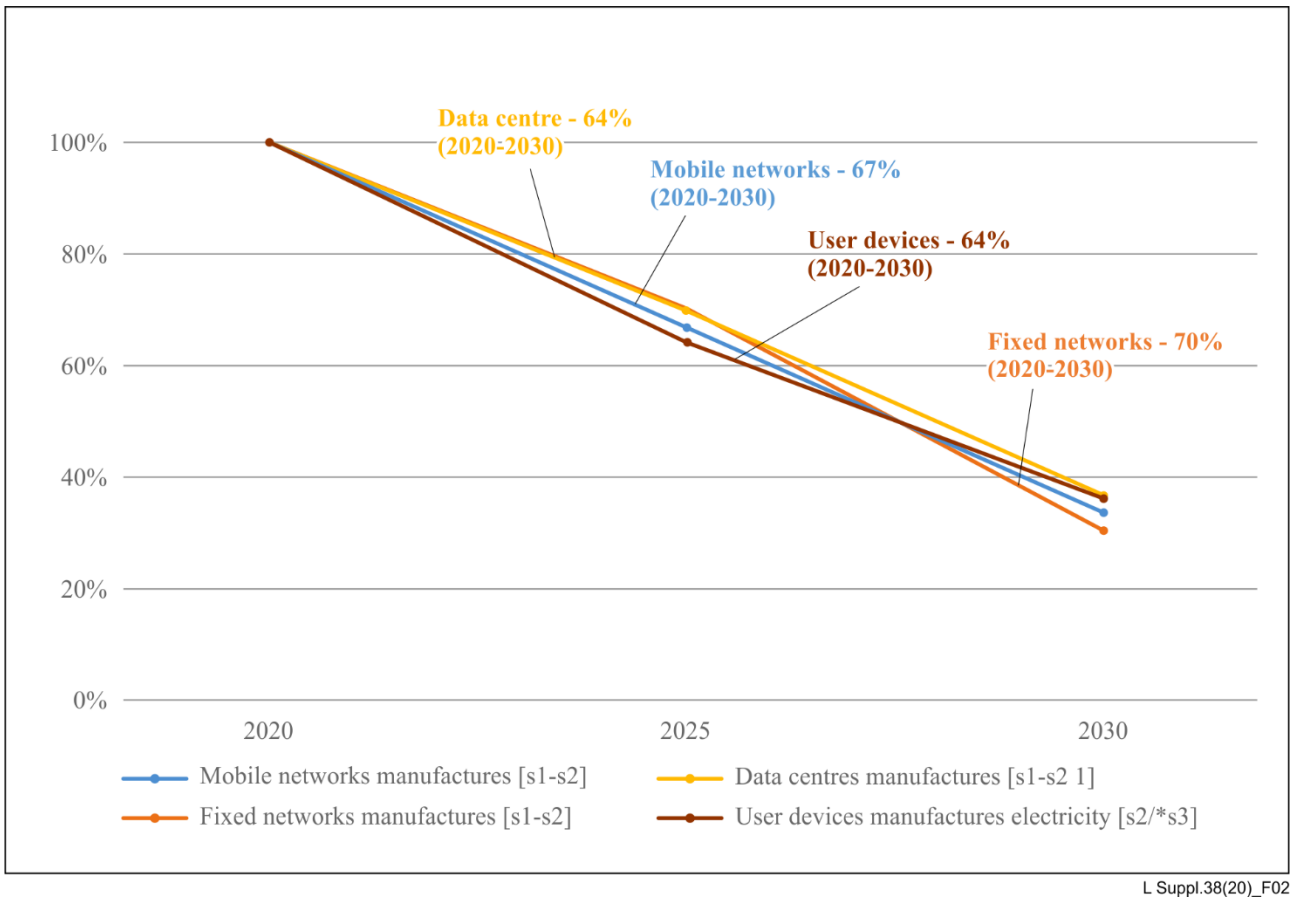

Figure 2 – Trajectories for ICT manufacturers for 2020-2030 in line with [ITU-T L.1470]

NOTE – The target level of these trajectories might not be achievable for the non-electricity part of production activities. Therefore, manufacturers with production activities cannot generally apply this curve to the non-electricity part of such activities. Trajectories for such activities will be addressed in a separate Supplement.

7.3 Relationship with existing SBTi methods

Recently SBTi published the ICT sectoral target-setting approach for ICT network and data centre operators in line with [ITU-T L-Suppl.37]. This Supplement intends to provide input for a corresponding target-setting approach for ICT manufacturers, to support ICT manufacturers in setting 1.5°C aligned targets in line with climate science.

Because of the diverse nature of devices and applications covered by the ICT sector, a separate pathway has been developed for each of the main ICT sub-sectors.

The ICT sectoral target-setting approach takes an absolute approach. This contrasts with the sectoral decarbonization approach (SDA), which applies a convergence approach to calculate targets along intensity decarbonization pathways. The reasons for this approach are explained in technical detail in Appendix II, which shows how the usual intensity approach reduces to an absolute convergence in the case of ICT applications and their electricity usage.

This does not restrict those ICT organizations who may like to present their targets as intensities, so long as the absolute reduction is in line with the trajectories defined in this sectoral target-setting approach.

In this case, ICT organizations need to monitor at regular intervals that their intensity metric does not deviate from the absolute trajectory.

7.4 Achieving targets

The ICT sector is dynamic and demands for faster transmission and more capacity are ever growing. Historically, the sector has been able to mitigate these requirements through technology development and purchase of renewable electricity. However, as new technologies continue to increase in both size and complexity, this approach needs further effort. Hence the 1.5°C trajectory is a challenging one, which will not happen without commitment and ambitious action.

For the period 2020-2030, the main strategy to decarbonize the ICT manufacturers and suppliers, to align with the 1.5°C trajectories, includes the implementation of simultaneous, vigorous and urgent actions in the following fields:

- continued implementation of energy efficiency plans;
- switch to renewable/low carbon electricity supply;
- low carbon fleet, travels and facilities;
- low carbon production processes;
- encouragement of carbon consciousness and use of renewables among end-users.

The continuous improvement of energy performance of ICT goods, networks and services is fundamental and is also driven from a cost perspective. However, the ICT sector is based on the use of electricity, and energy efficiency measures alone would not be sufficient. Thus, all these mechanisms need to be addressed to decarbonize the ICT sector in line with the 1.5°C trajectories.

8 How to calculate an ICT sub-sector target

Extensive and detailed general guidance on setting science-based targets is already provided in [SBTi 2020a] and is not reproduced here. For example, the manual describes the SBTi criteria for determining many aspects of a target including the boundaries of included emissions, the determination of baseline and target years, recalculation to reflect significant changes in company structure and specific exclusions, such as offsets and product-related emission reductions.

NOTE – Calculations should use the most recent and relevant emission factors. More specific guidance on the use of emission factors is available in the ITU-T L.14XX series of Recommendations.

8.1 Setting an ICT company sub-sector target for scope 1 and 2 emissions

The steps in clauses 8.1.1 to 8.1.4 should be adopted to set a science-based target by an ICT organization. In accordance with [GHGP 2015], all GHGs should be included both in the scope 1 and 2 emissions measurement and in the calculation of targets.

8.1.1 Select a baseline year

The SBTi recommends using the most recent year for which data is available.

It should be noted that 2015 is the baseline year for the sector and sub-sectors trajectories as specified in [ITU-T L.1470]. Thus, companies may also be interested in monitoring their yearly emissions compared to 2015 levels if these 2015 emissions are readily available.

8.1.2 Select a target year

Targets must cover a minimum of 5 years, and due to the fast-changing nature of digital technologies, in accordance with this edition of this Supplement, ICT organization targets should be set no further ahead than 2030. In any case, it is worth noting that the SBTi criteria require companies to review, and, if necessary, revalidate their targets every 5 years from the date of the original target approval.

8.1.3 Measure scope 1 and 2 emissions

Scope 1 and 2 emissions need to be measured for the baseline year according to [GHGP 2015] using a common boundary approach across all company operations.

Emissions of ICT manufacturers are often not related to ICT specific activities, but rather emerge from sources such as office buildings or transport fleets. To address this, companies may choose to combine all their scope 1 and 2 emissions and derive an overall target in line with the 1.5°C trajectory from [ITU-T L.1470] as outlined in Figure 2 and Appendix III. This is the recommended option as it keeps the company consistent with a 1.5ºC trajectory for its overall operation. If a company has products in its portfolio that belong to more than one of the categories in Figure 2, the company may want to refer to different trajectories for different parts of their organization. For example, if an organization provides both mobile and fixed equipment, it may want to calculate the weighted average over the two sub-sector trajectories based on the relative amounts of their GHG emissions. Since the difference between the trajectories for the manufacturing part of the different sub-sectors is fairly small, it might be easier to refer to the trajectory with the higher ambition.

If ICT organizations want to set separate SBT targets for different aspects of their scope 1 and 2 emissions, such as use of facilities and transports, they may alternatively apply other relevant SBTi SDA tools to calculate their targets, and should then ensure that these follow a 1.5°C trajectory.

8.1.4 Calculating the science-based target

A sub-sector science-based target (SBT_s) is then calculated by multiplying the combined scope 1 and 2 emissions in the base line year ($\underline{CC_b}$) by an emissions reduction factor (ERF) to derive the maximum remaining emissions for the target year. The emissions reduction factor is based on the appropriate sub-sector emission reduction pathway (see Figure 2) and the baseline and target years.

$$SBT_s = CC_b \bullet ERF \quad (1)$$

ERF values for mobile, fixed and data centre sub-sectors, and for different baseline and target years compatible with clause 7.2 are listed in Appendix III. Appendix I explains how these factors have been derived and provides further guidance on scope 1 and 2 emissions.

8.1.5 Worked example for ICT manufacturers

An ICT manufacturer provisioning both mobile network equipment and smart phones selects 2019 as its baseline year and 2025 as its target year.

For both sub-sectors, the company decides to develop a combined target in line with Figure 2 to cover all its scope 1 and 2 emissions including such sources as their office buildings and transport fleet.

The combined scope 1 and 2 emissions from in-house activities associated with the design and manufacturing of mobile network equipment was 150 kt CO_2e in the baseline year.

The combined scope 1 and 2 emissions from in-house activities associated with the design and manufacturing of smartphones were 500 kt CO_2e in the baseline year.

Referencing the 2019 baseline and 2025 target years in Tables III.1 to III.4, the ERF for the manufacturing of network equipment is found to be 0,667 and for the smartphone 0,629.

The company's resulting science-based target (SBT) for 2025 is then given by:

$$SBT(2025) = 0{,}667 \times 150 + 0{,}629 \times 500 = 414 \text{ kt } CO_2e \quad (2)$$

i.e., the company should reduce its overall scope 1 and 2 emissions from 650 kt to 414 kt between 2019 and 2025.

9 Setting a target for scope 3 emissions

9.1 General

Scope 3 emissions include upstream activities, such as the production of goods and services purchased by the company, as well as downstream activities, such as operator or consumer use and disposal of

products sold by the company. A full list of scope 3 activities is given in Table IV.1. Scope 3 emissions are often the largest source of emissions for companies and therefore represent the largest opportunity for GHG reductions. A comprehensive approach to incorporate GHG emissions measurement, management and reporting for scope 3 emissions may enable companies to focus on these opportunities.

Scope 3 emissions should be derived in alignment with [GHGP 2015] and [ITU-T L.1420].

The SBTi criteria for setting scope 3 targets are as described in the most recent SBTi criteria document. SBTi has also described criteria for setting scope 3 targets as indicated in clause 8. This ICT sector guidance has taken note of the SBTi guidance while developing more specific guidance.

To derive the scope 3 target, companies should first screen or calculate all scope 3 categories and based on the results, exclude categories that are either not applicable or immaterially small.

In this context, two groups of scope 3 emissions can be identified. The first group relates to emissions that should be the focus of the target setting (prioritized scope 3 emissions) as listed in clause 9.2. The second group of scope 3 emissions (including the other scope 3 categories) can be addressed on a voluntary basis.

This Supplement encourages companies to set targets that aim for absolute rather than relative emission reductions and to be as inclusive as possible with regard to scope 3 categories.

Similar to scope 1 and 2 targets, companies may choose to set an overall absolute reduction target for all of their scope 3 emissions or set specific targets for different parts of their scope 3 emissions.

NOTE – At the date of agreement of this Supplement, examples of published SBT scope 3 targets for ICT companies aligned with 1.5°C contain the following categories, standalone or in combination:

- absolute reduction of overall scope 3 GHG emissions (as a percentage);
- absolute reduction of selected scope 3 categories (as a percentage);
- reduction in scope 3 emissions in terms of intensity (as a percentage per unit);
- suppliers with SBTs (as a percentage by emissions or by expenditure);
- reduction in energy consumption of comparable products (as a percentage);
- reduction in emissions per operation (as a percentage).

Particularly, ICT organizations should consider the trajectories given in clause 7 of [ITU-T L.1470] as input/sources to determine a scope 3 ambition level in line with the 1.5ºC trajectories of the ICT sector and its sub-sectors.

Companies wanting to set specific targets for the prioritized scope 3 categories should refer to clause 9.2.

9.2 Guidance for setting specific targets for prioritized scope 3 emissions

These categories should either be covered by a separate absolute scope 3 target or form part of the overall scope 3 targets, unless they are considered insignificant compared to the overall footprint.

9.2.1 Category 1: Purchased goods and services

When defining its SBTs for category 1, a company may refer to either emission reductions among its suppliers or to suppliers having established 1.5°C compatible SBTs. In both cases, the scope 3 targets should cover a minimum of two-thirds of all suppliers by expenditure or emissions.

To address small- or medium-sized enterprises (SMEs) specifically, organizations may refer to [SME Climate Hub] for guidance.

As data related to purchased goods and services rely on data collected from suppliers, it should be recognized that emission estimates for this category may include a lot of uncertainty, as suppliers

have different qualities in their own reporting and in allocating emissions to the company setting its targets.

9.2.2 Category 2: Capital goods

When defining its SBTs for category 2, a company may refer to either emission reductions among its suppliers or to suppliers having established 1.5°C compatible SBTs. In both cases, the scope 3 targets should cover a minimum of two-thirds of all suppliers by expenditure or emissions.

To address SMEs specifically, organizations may refer to the SME Climate Hub for guidance.

As data related to purchased goods and services rely on data collected from suppliers, it should be recognized that emission estimates for this category may include a lot of uncertainty, as suppliers have different qualities in their own reporting and in allocating emissions to the company setting its targets.

As capital goods purchases vary from year to year, the target progress may differ substantially in a year over year comparison.

This category might be omitted from the target setting if contributions from this category are small compared to the overall emissions (around 0.5% of total scope 1 + 2 + 3 emissions).

NOTE 1– Emissions from capital goods are usually based on financial data on property, plant, and equipment additions during the reporting year and can be estimated by using the GHGP 2015 scope 3 evaluator tool.

NOTE 2 – To reduce the overall company footprint, this category (such as replacing internal combustion engine cars with electric vehicle cars) might even be allowed to grow substantially during a transition period to reduce carbon emissions overall.

9.2.3 Category 4: Transportation and distribution

This category includes emissions from inbound and outbound logistics and data may be based on delivery data and transportation mode of the top logistics supply partners.

A separate target for this category should aim for absolute emission reductions.

9.2.4 Category 6: Business travel

Any specific target should cover at least business air travel, which has the biggest impact out of business travel modes, but should also include other modes of transport, if possible.

NOTE – Travel information can often be obtained from travel agencies. Data supplied should include distance travelled, delineated by flight distance ranges and cabin class.

9.2.5 Category 7: Employee commuting

Input for specific target setting for commuting can be based on employee surveys. To monitor the progress towards the target, such surveys should be performed on a regular basis, every 5 years at a minimum, or more often if there are reasons to conduct these surveys more frequently (e.g., acquisitions and mergers or changes in travel patterns).

The boundaries of the survey should be documented. For example, it can include criteria identifying country targets (percentage of employees represented), assumption of commuting (to office and to home, number of working days per week, number of weeks in a year).

9.2.6 Category 11: Use of products sold

Organizations wanting to set specific targets for use of products sold should set targets that drive absolute emission reductions, such as reduction in energy consumption of comparable products (as a percentage) over a certain time period. When setting these targets, ICT manufacturers should be aware of the trajectories developed for operators in [ITU-T L.1470] and establish an ambition level that supports the operators in reaching their targets.

Appendix I

The ICT sectoral target setting methodology

I.1 Introduction to the SBTi standard sectoral decarbonization approach

The standard SDA [SBTi 2015] is a method for establishing sectoral decarbonization pathways using physical intensity metrics that converge to a common emissions intensity. An intensity target is then determined by a reduction in emissions relative to a specific business metric, such as production output of the company (e.g., tonnes of CO_2 equivalent (CO_2e) per tonne of product produced). However, this ICT sectoral target-setting method takes an absolute approach as explained in Appendix II.

I.2 Factors influencing an ICT sub-sector pathway

Sectoral SDA pathways extend an existing sector baseline data into the future. This requires an evaluation of how the sector will develop, including its energy performance. This is illustrated in Figure I.1.

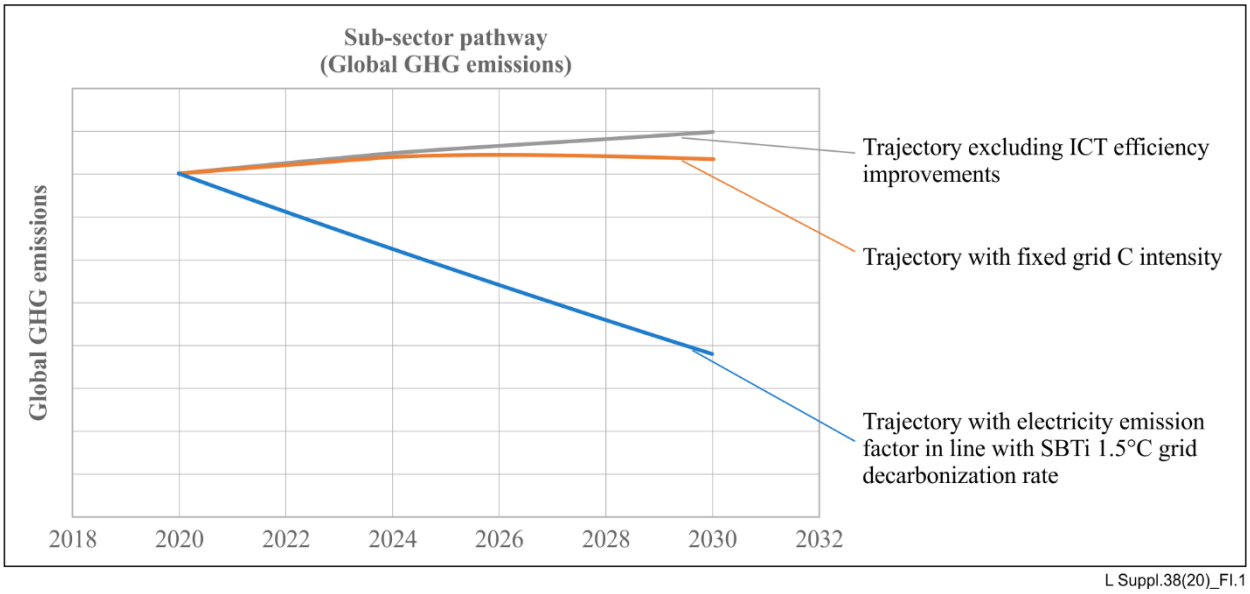

Figure I.1 – Trajectory development

In Figure I.1, the blue line represents a final ICT 1.5°C trajectory that takes into account both efficiency improvements and reduced carbon intensities of electricity generation. The orange and grey lines represent worse case situations. The orange line shows what would happen if the power sector fails to decarbonize as required to comply with its own 1.5°C trajectory and the ICT sector fails to mitigate that through power purchase agreements or investments in renewable supply. The grey line shows what would happen if expected efficiencies in the ICT sector also fail to materialize.

I.3 Applying a sectoral target-setting approach to ICT

Until now, the existing sectors covered by SDA tools [SBTi 2015] exclude any specific reference to ICT. Instead, [SBTi 2020a] refers to "computer, electronic, optical products" and "electrical equipment", and places their manufacture in the "All other industry" category and recommends that this sub-sector set an absolute/intensity target in line with the absolute contraction approach.

With the publication of this Supplement, SBTi establishes trajectories for the ICT sector that consider the situation of the following sub-sectors: ICT manufacture and ICT supply.

I.4 The main scope 1 and 2 emissions contributions

For ICT organizations, emissions associated with the generation and subsequent use of electricity dominate their combined scope 1 and 2 footprints. The pathway associated with these emissions is therefore expected to be similar to that of the power sector, which actually reaches a zero-convergence point by 2050 as shown in Table I.1.

Appendix II offers a mathematical analysis of the implications of such a zero-convergence point that results in the following absolute, rather than intensity-based, target trajectory according to:

$$C_{SBT,y} = CC_b \cdot SC_{s,y}/SC_{s,b} \quad \text{(I-1)}$$

where:

CC_b: CO_2 emissions of company in base year b (in tonnes of CO_2e);

$SC_{s,b}$: CO_2 emissions of sub-sector s in base year b (in tonnes of CO_2e);

$SC_{s,y}$: CO_2 emissions of sub-sector s in year y (in tonnes of CO_2e).

I.4.1 Power sector carbon emission intensity

The grid emission intensities used for the period 2015-2020 reflect actual conditions of the ICT sector including its geographical distribution in line with [Malmodin]. The intensities for 2025, 2030 and 2050 are in line with the [IEA ETP] B2DS remodelled by SBTi to align with [IPCC 1.5] 1.5ºC pathways.

Table I.1 – 1.5ºC pathway electricity emission factors used by SBTi

Year	2025	2030	2050
Emission factor (kg CO_2e/kWh)	0.281	0.160	0.000

More details on the selection of electricity emission factors are provided in [ITU-T L.1470].

I.4.2 Company power generation

In addition to using electricity delivered over the grid, ICT companies, and most particularly operators in the mobile sub-sector, often generate their own power on-site (e.g., using diesel fuelled generators or photovoltaic panels). The ICT emission pathways have incorporated this aspect on the assumption that, similar to grid electricity, all emissions from such generation will be eliminated by 2050. This allows such generation to be covered by the simplified SDA approach identified in the foregoing.

I.4.3 Emission reduction factors

Equation I-1 shows how a company's sub-sector SBT in target year y is derived by multiplying its emissions in base year b (CC_b) by the ratio of the sub-sector's emissions in the target year ($SC_{s,y}$) over the sub-sector's emissions in the base year ($SC_{s,b}$). This ratio is the ERF.

The sub-sector pathways presented in clause 7.2 are based on emission figures from [ITU-T L.1470] for 2015 to 2030 in 5 year intervals. In order to calculate an ERF for every year between 2015 and 2030, a linear interpolation was taken across each 5 year period. The resulting ERFs are provided in Appendix III.

Appendix II

Establishing an ICT sub-sector pathway

II.1 Introduction

This appendix is a technical explanation of why the ICT sectoral target-setting approach does not follow the usual intensity approach, but follows a simplified absolute approach. The reader is recommended to be familiar with the methodology of [SBTi 2015] before progressing with this appendix.

II.1.1 Principles

Usually the first step in establishing an SDA pathway is to identify an appropriate activity metric. For example, in the case of the power sector, activity levels are measured by the number of megawatt hours of electricity generation in a given year. For commercial buildings it is the floor area in square metres of real estate for a given year.

Initially it was assumed that the ICT sector would also adopt an intensity model. As it was considered very unlikely that there could be a single form of activity metric relevant to all ICT sub-sectors, a sub-sector approach was adopted.

Based on the mathematical equations presented in [SBTi 2015], an ICT sub-sector pathway associated with use-phase electricity would follow:

$$SC_{s,y} = SA_{s,y} \bullet SE_{s,y} \bullet PI_y \quad \text{(II-1)}$$

where:

$SA_{s,y}$: activity in year y (activity units) for ICT sub-sector s;

$SE_{s,y}$: energy intensity in year y (megawatt hours per activity) for ICT sub-sector s;

PI_y: carbon intensity for the power sector in year y (tonnes of CO_2e per megawatt hour).

II.2 Calculating a company target

According to the [SBTi 2015] methodology, a company-specific carbon intensity trajectory would be derived from the sub-sector intensity trajectory. Such a company pathway will depend on its initial performance d, and its expected future market share. The initial performance d is defined as the difference between the company's carbon intensity in the base year and the sub-sector carbon intensity in the year 2050. It is calculated using equation II-2.

$$d = CI_b - SI_{s,2050} \quad \text{(II-2)}$$

where:

d: initial company performance in the base year relative to the 2050 sector target (tonnes of CO_2e per activity);

CI_b: CO_2 intensity of the company in base year b (tonnes of CO_2e per activity);

$SI_{s,2050}$: CO_2 intensity of the sub-sector s in year 2050 (tonnes of CO_2e per activity).

The company's expected future activity levels are then combined with the sub-sector's predicted activity levels to calculate the company's market share parameter[1] for any given year following equation II-3.

$$m_y = (CA_b/SA_{s,b})/(CA_y/ SA_{s,y}) \quad \text{(II-3)}$$

where:

m_y: market share parameter in year y (as a percentage);

CA_b: activity of the company in base year b;

$SA_{s,b}$: activity of sub-sector s in base year b;

CA_y: activity of the company in year y;

$SA_{s,y}$: activity of sub-sector s in year y.

To preserve the integrity of the necessary carbon budget, [SBTi 2019] introduced a safeguard to the market share parameter such that when a homogeneous company projected a decrease in their activity levels leading to a reduced market share then the market share parameter is capped to 1.0. This is achieved through the following adjustment.

$$= \text{if } (m_y \leq 1, m_y, 1) \quad \text{(II-4)}$$

As described in the foregoing, the standard SDA method assumes that the CO_2 intensity for the companies in all homogeneous sectors tends to converge in 2050. This convergence is represented by an index of the sector's decarbonization, being equal to 1 in the base year and 0 in 2050. This index is calculated following equation II-5.

$$p_{s,y} = (SI_{s,y} - SI_{s,2050})/(SI_{s,b} - SI_{s,2050}) \quad \text{(II-5)}$$

where:

$p_{s,y}$: decarbonization index of sub-sector s in year y;

$SI_{s,y}$: CO_2 intensity of sub-sector s in year y (tonnes of CO_2e per activity);

$SI_{s,2050}$: CO_2 intensity of sub-sector s in target year 2050 (tonnes of CO_2e per activity);

$SI_{s,b}$: CO_2 intensity of sub-sector s in base year b (tonnes of CO_2e per activity).

Combining the company's initial performance parameter d with its market share m and the sectoral decarbonization index p for year y results in an equation that provides the company's intensity target for any year y between the base year and the target value in the year 2050 (equation II-6).

$$CI_y = d \bullet p_{s,y} \bullet m_{s,y} + SI_{s,2050} \quad \text{(II-6)}$$

where:

CI_y : intensity target of the company in year y (tonnes of CO_2e per activity).

A company's target for any year y ($C_{SBT,y}$) will now be given by equation II-7.

$$C_{SBT,y} = CI_y \bullet CA_y \quad \text{(II-7)}$$

II.3 ICT application

As the principal part of the ICT footprint is dependent on electricity consumption, it is reasonable to expect that the ICT pathway will be strongly influenced by that of the power sector.

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[1] Note that m_y is not the change in market share, but rather the inverse, resulting in a decreasing parameter when the company's market share is increasing.

In that case, as the carbon intensity of the power sector essentially reaches zero by 2050 as shown in Table I.1, it follows that the electricity component of an ICT sub-sector will do the same.

This makes $SI_{s,2050} = 0$ thus allowing a dramatic simplification of the equations previously given as follows.

Equation (II-2) now becomes:

$$d = CI_b \tag{II-2a}$$

Equation (II-5) becomes:

$$p_{s,y} = SI_{s,y}/SI_{s,b} \tag{II-5a}$$

Equation (II-6) becomes:

$$CI_y = d \bullet p_{s,y} \bullet m_{s,y} \tag{II-6a}$$

If the conditionality statement (II-4) is true ($m_y \leq 1$), then equation (II-7) now extends to:

$$\begin{aligned} C_{SBT,y} &= CI_b \bullet (SI_{s,y}/SI_{s,b}) \bullet (CA_b/SA_{s,b})/(CA_y/SA_{s,y}) \bullet CA_y \\ C_{SBT,y} &\bullet= (CI_b \bullet CA_b) \bullet (SI_{s,y} \bullet SA_{s,y})/(SI_{s,b} \bullet SA_{s,b}) \end{aligned} \tag{II-7a}$$

Otherwise written as:

$$C_{SBT,y} = CC_b \bullet SC_{s,y}/SC_{s,b} \tag{II-8a}$$

where:

CC_b: CO_2 emissions of company in base year b (tonnes of CO_2e);

$SC_{s,b}$: CO_2 emissions of sub-sector s in base year b (tonnes of CO_2e);

$SC_{s,y}$: CO_2 emissions of sub-sector s in year y (tonnes of CO_2e).

Or, if the conditionality statement (II-4) is false ($m_y > 1$), then equation (II-7) extends to:

$$\begin{aligned} C_{SBT,y} &= CI_b \bullet (SI_{s,y}/SI_{s,b}) \bullet CA_y \\ C_{SBT,y} &= (CC_b/CA_b) \bullet (SC_{s,y}/SA_{s,y})/(SC_{s,b}/SA_{s,b}) \bullet CA_y \end{aligned} \tag{II-7b}$$

which is otherwise written as:

$$C_{SBT,y} = CC_b \bullet SC_{s,y}/SC_{s,b} \bullet (CA_y/SA_{s,y})/(CA_b/SA_{s,b}) \tag{II-8b}$$

where:

CC_b: CO_2 emissions of company in base year b (tonnes of CO_2e);

$SC_{s,b}$: CO_2 emissions of sub-sector s in base year b (tonnes of CO_2e);

$SC_{s,y}$: CO_2 emissions of sub-sector s in year y (tonnes of CO_2e).

This has re-introduced the $m_{s,y}$ term such that equation (II-8b) can be re-written as:

$$C_{SBT,y} = CC_b \bullet SC_{s,y}/SC_{s,b}/m_{s,y} \tag{II-9}$$

However. in this case, $m_{s,y}$ has already been forced to 1 which makes equation (II-9) the same as equation (II-8a).

In conclusion, equation (II-8a) describes the decarbonization pathway of the electricity component of an ICT sub-sector for both logical outcomes of the conditional statement II-4.

Appendix III

Emission reduction factors for ICT manufacturers

These ERFs in Tables III.1 to III.4 were derived from the trajectories described in clause 7.2. and can be used by ICT manufacturers to set an SBT in line with this company guidance.

NOTE – An SBT reduction target must cover a minimum of 5 years and a maximum of 15 years from the date the company's target is submitted to the SBTi for an official validation.

Table III.1 – Emission reduction factors for mobile network manufacturer target level (compared to base year)

	Target year						
Base year	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
2019	0.733	0.667	0.600	0.533	0.467	0.400	0.333
2020		0.667	0.600	0.533	0.467	0.400	0.333
2021			0.643	0.571	0.500	0.429	0.357
2022				0.615	0.538	0.462	0.385
2023					0.583	0.500	0.417
2024						0.545	0.455
2025							0.500

Table III.2 – Emission reduction factors for fixed network manufacturer target level (compared to base year)

	Target year						
Base year	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
2019	0.760	0.700	0.640	0.580	0.520	0.460	0.300
2020		0.700	0.640	0.580	0.520	0.460	0.300
2021			0.681	0.617	0.553	0.489	0.319
2022				0.659	0.591	0.523	0.341
2023					0.634	0.561	0.366
2024						0.605	0.395
2025							0.429

Table III.3 – Emission reduction factors for data centre manufacturer target level (compared to base year)

	Target year						
Base year	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
2019	0.772	0.710	0.648	0.586	0.525	0.463	0.370
2020		0.697	0.636	0.576	0.515	0.455	0.364
2021			0.677	0.613	0.548	0.484	0.387
2022				0.655	0.586	0.517	0.414
2023					0.630	0.556	0.444
2024						0.600	0.480
2025							0.522

Table III.4 – Emission reduction factors for user device manufacturer target level (compared to base year)

	Target year						
Base year	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
2019	0.699	0.629	0.558	0.488	0.417	0.347	0.353
2020		0.641	0.569	0.497	0.425	0.353	0.359
2021			0.613	0.535	0.458	0.380	0.387
2022				0.580	0.496	0.412	0.420
2023					0.542	0.450	0.458
2024						0.496	0.504
2025							0.561

Appendix IV

ICT sector scope 3 categories

[ITU-T L.1420] gives guidance to ICT companies wanting to report their scope 1 to 3 emissions. It builds on and gives more details than [ISO 14064-2] and [GHGP 2015]. Table IV.1 from Appendix I of [ITU-T L.1420] summarizes the different scope 3 activities from the [GHGP 2015], which are material from an ICT company perspective.

NOTE – The phrase "based on LCA" means that the full life cycle should be considered.

Table IV.1 – Various GHGP 2015 scope 3 activities

	Category	ICT application	Comments
S3A (Note 1)	Purchased goods and services	• Production-related procurement cradle-to-gate. • Non-production related procurement: Paper usage cradle-to-gate Use of hotels • Related fuel and energy supply chain Optional • Other non-production related procurement of goods and services (Note 2) • Manufacturing of vehicles, facilities and infrastructure • Manufacturing of office equipment • Product take-back services for sold products (as a purchased service not handled by the organization itself)	Based on LCA (Note 3)
S3B	Capital Goods	• Computer-ware cradle-to-gate (Notes 4,5) • Related fuel and energy supply chain Optional: • Machinery (Note 6) production • Cradle-to-gate emissions from vehicles, facilities and infrastructure	Based on LCA
S3C	Fuel- and energy related activities not included in scope 1 or 2	• Fuel supply chain (Note 7) including transports. Infrastructure when data becomes available (Note 8) for fuel consumed by the reporting company • Energy supply chain including transports. Infrastructure when data becomes available (Note 9) for energy consumed by the reporting company	The whole supply chain has to be taken into account for electricity including infrastructure, land use; diffuse emissions of methane from oil and coal extraction; SF_6 from transformer stations and handling of waste from electricity production. Based on LCA. Electricity is of high importance for ICT industry. The fuel supply chain is also of great importance for other forms of energy (e.g., district heating) and for fuels consumed (incinerated) at sites.

Table IV.1 – Various GHGP 2015 scope 3 activities

	Category	ICT application	Comments
S3D	Upstream transportation and distribution	• Transports of products purchased by the organization (Note 10) (from supplier to the organization; between organization's facilities; to customer if paid by the organization) • Transports purchased by the organization • Related fuel supply chain Optional: • Manufacturing of vehicles, facilities and infrastructure • Storage during distribution • Consultants (Note 11) working outside facilities used by the organization	
S3E	Waste generated in operation	Optional: • Scope 1 and 2 emissions waste generated in operation that occur during disposal or treatment	Considered to be of low significance for ICT and does also have a high uncertainty
S3F	Business travel	• Air, road, rail and boat travel • Related fuel supply chain Optional: • Manufacturing of vehicles, facilities and infrastructure	Over time the effects of teleworking are likely to affect these emissions and also results for employee commuting and other energy indirect GHG emissions (Note 12).
S3G	Employee commuting	• Air, road, rail and boat travel including public transports • Related fuel supply chain Optional: • Manufacturing of vehicles, facilities and infrastructure	Based on behaviour statistics Over time the effects of teleworking are likely to affect these emissions and also results for employee commuting and other energy or indirect GHG emissions (Note 13).
S3H	Upstream leased assets	• Computer-ware cradle-to-gate (Notes 14,15) • Related fuel and energy supply chain Optional • Leased cars (Note 16) • Manufacturing of office equipment • Manufacturing of vehicles, facilities and infrastructure	
S3J	Downstream transportation and distribution	• Outbound transports ordered by the customer (Note 17) • Related fuel supply chain Optional: • Manufacturing of vehicles, facilities and infrastructure	

Table IV.1 – Various GHGP 2015 scope 3 activities

	Category	ICT application	Comments
S3K	Processing of sold intermediate products	• Scope 1 and 2 during processing	
S3L	Use of sold products	• Scopes 1 and 2 of use • Scopes 1 and 2 impact from use of support equipment necessary to operate the equipment (power supply and cooling) • Related fuel and energy supply chain Optional: • Support activities (indirect use phase emissions) including repair, servicing and maintenance of sold products	
S3M	EoLT of sold products	• Own disposal/treatment • Related fuel and energy supply chain Optional (due to uncertainty) • Scopes 1 and 2 during disposal/treatment	Based on LCA
S3N	Downstream leased assets	• Scopes 1 and 2 during operation • Related fuel and energy supply chain Optional • Manufacturing and construction	
S3O	Franchises	• Scopes 1 and 2 during operation • Related fuel and energy supply chain Optional: • Manufacturing and construction	
S3I	Investments	Optional: • Partially owned companies	Recommended that the legal unit reports its own emissions to avoid double accounting

NOTE 1 – Also, goods and networks, as defined in [ITU-T L.1410], are examples of indirect GHG emission sources.

NOTE 2 – Services, e.g., finance, marketing, consultants and data traffic, could potentially be of interest for further studies in the future, but for the time being very little input data are available as a basis for inventories.

NOTE 3 – See clause 8.3.5.1.3 of [ITU-T L.1420].

NOTE 4 – Use of PCs accounted for as "energy indirect GHG emissions".

NOTE 5 – Computerware includes PCs, servers, printers and copy machines etc. May in some organizations be part of leased assets.

NOTE 6 – Machinery for production, development, test and repair.

NOTE 7 – Lack of LCA data for district heating notified.

NOTE 8 – Lack of data so far.

NOTE 9 – Lack of data so far.

NOTE 10 – It is assumed that other Scope 3 (e.g., S3A, S3B) emissions contain their own transports.

NOTE 11 – Consultants located in the organization facilities should be accounted for as employees for practical reasons.

NOTE 12 – Energy use in visited organization neglected due to methodological problems/ uncertainty in data.

NOTE 13 – Energy use in visited organization neglected due to methodological problems/ uncertainty in data.

NOTE 14 – Use of PCs accounted for as scope 2 GHG emissions.

NOTE 15 – May in some organizations be part of Capital goods.

NOTE 16 – Not recommended for inclusion because already included in commuting/business travels.

NOTE 17 – It is assumed that other Scope 3 emissions contain their own transports.

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