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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 to operators of mobile networks, fixed networks and datacentres on setting 1.5°C aligned targets compliant with Recommendation ITU-T L.1470

ITU-T L-series Recommendations – Supplement 37

International Telecommunication Union

ITU-T L-SERIES RECOMMENDATIONS

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Supplement 37 to ITU-T L-series Recommendations

Guidance to operators of mobile networks, fixed networks and datacentres on setting 1.5°C aligned targets compliant with Recommendation ITU-T L.1470

Summary

Supplement 37 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 decarbonisation pathways, described in detail in ITU-T L.1470 aligned to the IPCC Special Report on 1.5°C and developed to be used as a sectoral target-setting approach by the Science Based Targets Initiative (SBTi). This Supplement focuses exclusively on ICT organizations operating mobile networks, fixed networks and/or data centres. Guidance for further ICT sub-sectors will be covered separately.

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FOREWORD

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Guidance to operators of mobile networks, fixed networks and datacentres on setting 1.5°C aligned targets compliant with Recommendation ITU-T L.1470

1 Scope

This Supplement supports information and communication technology (ICTs) companies in setting science-based targets for greenhouse gases (GHGs) according to a set of new decarbonisation pathways described in detail in [ITU-T L.1470] 'GHG emissions trajectories for the ICT sector compatible with the UNFCCC Paris Agreement'[1] and aligned to the IPCC Special Report on 1.5 ^{o}C and developed to be used as a sectoral target-setting approach by the Science Based Targets Initiative (SBTi).

Currently the guide focuses exclusively on ICT companies operating mobile networks, fixed networks and/or data centres. This Supplement was developed jointly by ITU-T Study Group 5, SBTi, GSM-A and GESI and the same content is reflected in [SBTi 2020]. Guidance for further ICT sub-sectors will be covered separately.

NOTE – The trajectories for data centres may also be applied by companies in any other sectors that are operating their own data centres for the data centre component of their science-based target.

2 References

[ITU-T L.1420] Recommendation ITU-T L.1420 (2012), *Methodology for energy consumption and greenhouse gas emissions impact assessment of information and communication technologies in organizations.*

[ITU-T L.1450] Recommendation ITU-T L.1450 (2018), *Methodologies for the assessment of the environmental impact of the information and communication technology sector.*

[ITU-T L.1470] Recommendation ITU-T L.1470 (2020), *Greenhouse gas emissions trajectories for the information and communication technology sector compatible with the UNFCCC Paris Agreement*.

[ISO 14064-2] ISO 14064-2:2019, *Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements*.

[GHGP 2011] The Greenhouse Gas Protocol (2011), *Corporate Value Chain (Scope 3) Accounting and Reporting Standard, Supplement to the GHG Protocol Corporate Accounting and Reporting Standard.*

[GHGP 2014] The Greenhouse Gas Protocol (2014), *A Corporate Accounting and Reporting Standard, Revised Edition.*

[GHGP 2015] The Greenhouse Gas Protocol (2015), *GHG Protocol Scope 2 Guidance, An amendment to the GHG Protocol Corporate Standard.*

[SBTi 2015] SBTi (2015), *Sectoral Decarbonization Approach (SDA): A method for setting corporate emission reduction targets in line with climate science, Version 1.*

1 The pathways are described in detail in [ITU-T L.1470]: https://www.itu.int/rec/T-REC-L.1470/en

[SBTi 2019a] SBTi (2019), *Foundations of Science-based Target Setting, Version 1.0.*

[SBTi 2019b] SBTi (2019), *Science-Based Target Setting Manual, Version 4.0.*

[SBTi 2019c] SBTi (2019), *Criteria and Recommendations, Version 4.0.*

[SBTi 2020] ITU, SBTi, GSM-A, GESI (2020), *Guidance for ICT companies setting science-based targets (mobile networks operators, fixed networks operators and data centres operators).*

3 Definitions

3.1 Terms defined elsewhere

This Supplement uses the following terms defined elsewhere:

3.1.1 ICT manufacturer [ITU-T L.1470]: Organisation which has the financial and organisational control of the design and production of ICT goods.

3.1.2 ICT organisation [ITU-T L.1420]: An organisation, the core activity of which is directly related to the design, production, promotion, sales or maintenance of ICT goods, networks or services.

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

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

3.1.5 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.

3.2 Terms defined in this Supplement

This Supplement defines the following term:

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

4 Abbreviations and acronyms

B2DS Below 2-degrees scenario

ERF Emission Reduction Factors

ETP Energy Technology Perspectives

GHG Greenhouse Gas

ICT Information and Communication Technology

SBT Science Based Targets

SDA Sectoral Decarbonisation Approach

1.5DS 1.5-degrees scenario

2DS 2-degrees scenario

5 Conventions

None.

6 Background information

6.1 Structure

This Supplement is divided into three main clauses and three appendices. This clause covers a general introduction. Clause 7 briefly explains the trajectories and how the target setting methodology has been developed and clause 8 provides instructions to assist companies with setting targets. 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 the Science Based Targets initiative (SBTi) need to consider the greenhouse gas (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 defined by the GHG Protocol Corporate Standard. If an ICT organization has significant value chain (scope 3) emissions – over 40% of total scope 1, 2 and 3 emissions – it is also required to set a scope 3 target which 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 Guidance 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 organization in including the use of electricity, energy, and fuel for support activities (including service facilities such as offices, transport fleet, etc.).

Since most ICT organizations have significant scope 3 emissions, it will also give 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 a mobile operator may also run fixed networks, as well as data centres) it can split its emissions accordingly and then add the resulting sub-sector targets together to obtain a company-wide target.

It is recognised that there are significant geographic differences among ICT operators – implying there are 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 for different geographical operations in the first release of this guidance document.

7 Trajectories consistent with a 1.5°C scenario

7.1 Development of trajectories

The underlying methodologies and pathways were developed by an ICT sector collaboration between the Global Enabling Sustainability Initiative (GESI), the GSM Association (GSMA), the International Telecommunication Union (ITU) and the Science Based Targets initiative (SBTi).

The International Energy Agency (IEA) has also been closely involved and their support and guidance are gratefully acknowledged.

The work has been performed within an open working group populated by the involved organizations and in discussion with their wider membership.

This publication is based on [ITU-T L.1470] 'GHG emissions trajectories for the ICT sector compatible with the UNFCCC Paris Agreement' developed by ITU-T Study Group 5 'Environment, Climate Change and Circular Economy' in cooperation with GESI, the GSMA and the SBTi.

The science underlying global GHG scenarios is being continually updated. The trajectories used for this ICT sectoral target-setting approach will be reviewed in the future 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 Recommendation ITU-T L.1470 for mobile network operators, fixed network operators, data centre operators, user devices and manufacturers of ICT equipment. These trajectories underpin the ICT SBT approach described here and are described in detail in [ITU-T L.1470]. This Recommendation also proposes 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, carbon budget approach based on the ICT sector maintaining a fixed share of overall electricity usage (based on IEA ETP).

NOTE – The third normative approach considers the global need for electricity as outlined by IEA for different scenarios and develops an interim 1.5°C scenario within which ICT should not expand its current share of electricity. This electricity budget uses the IEA trajectories for 2-degrees scenario (2DS) and below 2-degrees scenario (B2DS) to derive a 1.5°C trajectory for world electricity usage through doubling the difference between them and subtracting it from 2DS [b-IEA ETP]. This is an interim approach as IEA has not yet defined a 1.5DS scenario. The budget is then used to define 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 1.5°C scenario, the trajectories will be reviewed when the new IEA scenarios are published.

The final, published pathways, as illustrated below, have been shown to be 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].

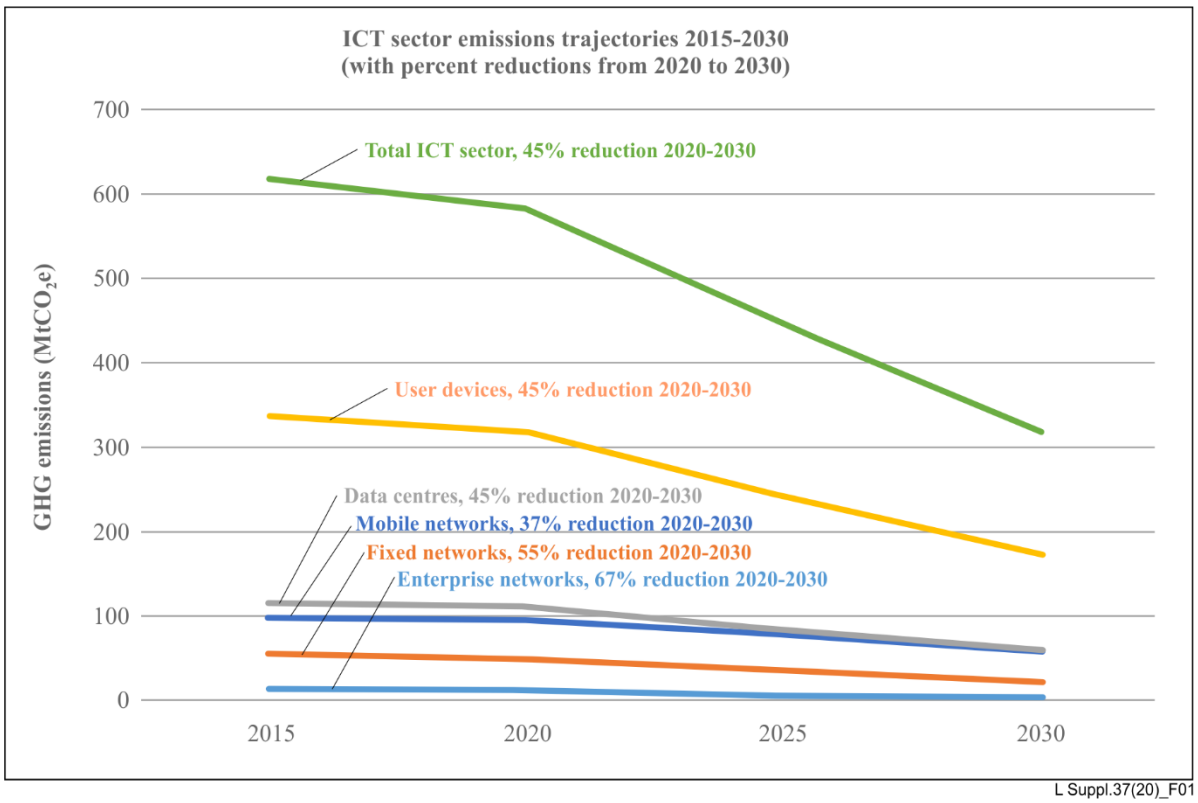

Figure 1 – Summary of ICT sector and sub-sector trajectories including embodied emissions and operation

NOTE – This graph shows the ICT sector life cycle emissions from a company accounting perspective. Hence it does not include emissions related to electricity grid losses and electricity supply chain. Values including those are about 20% higher. This is described in [ITU-T L.1470.

To apply these trajectories for operational emissions of ICT operators (i.e., company scope 1 and 2 emissions), Figure 2shows the trajectories for operational emissions only.

These trajectories include both operation of networks and data centres and supporting activities of these companies but excludes the embodied emissions.

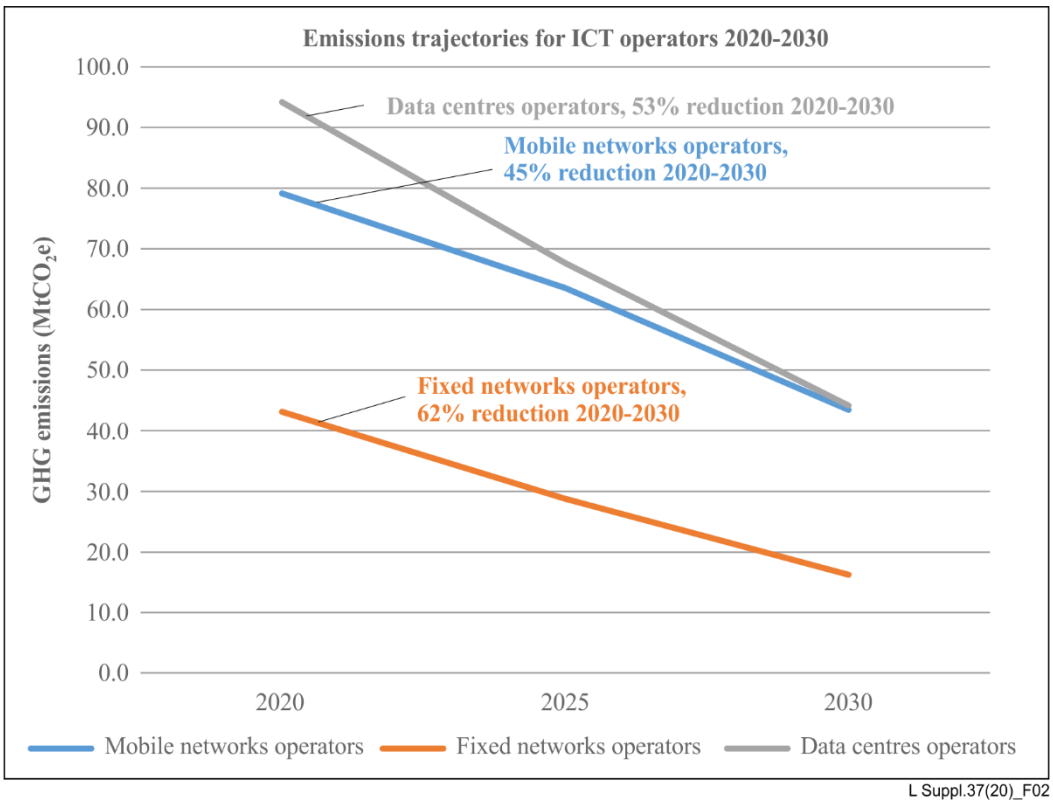

Figure 2 – Trajectories for ICT operators for 2020-2030

7.3 Relationship with existing SBTi methods

To date there has been no SBTi approved sectoral target-setting approach available for companies in the ICT sector. This guideline fills that gap and supports ICT organizations in setting 1.5°C aligned targets in line with climate science.

Due to 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 SDA which applies a convergence approach to calculate targets along intensity decarbonisation pathways. The reasons for this 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.

This does not restrict those ICT organizations who may wish 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, companies 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 a dynamic one and demands for faster transmission and more capacity is constantly increasing. 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 efforts. 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 sector, at the pace necessary to align with 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;

– Encouragement of carbon consciousness among end-users.

To decarbonise the ICT sector at this speed requires the sector to utilise all these mechanisms. The continuous improvement of energy performance is fundamental and is also driven from a cost perspective. However, the ICT sector based on the use of electricity and energy efficiency measures alone would not be sufficient. Thus, all three mechanisms need to be addressed to decarbonise in line with 1.5°C trajectories.

8 How to calculate an ICT sub-sector target

An extensive and detailed general guidance on setting science-based targets is already provided in the SBTi Manual [SBTi 2019b] 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.

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

The steps outlined in clauses 8.1.1 to 8.1.4 should be adopted to set a science-based target by a company with ICT operations. In accordance with the GHG Protocol Corporate Accounting and Reporting Standard, all greenhouse gases should be included both in the scope 1 and 2 emissions measurement and in the calculation of targets.

NOTE – The clarification regarding greenhouse gases is a complement to [SBTi 2020].

8.1.1 Select a baseline year

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

NOTE – 2015 is the baseline year for the sector and sub-sectors trajectories. 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, under this guidance 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 five 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. These need to be measured according to the GHG Protocol using a common boundary approach across all company operations.

Most ICT organizations will have activities in addition to their ICT operations, such as, office buildings and/or a transport fleet. In such cases, companies may choose to combine all their scope 1 and 2 emissions associated and derive a single SBT following the ICT sector method, thereby allowing the overall trajectory to stay within an ambitious 1.5°C trajectory. This is the simplest approach and at this point it is the recommended alternative as it keeps the company consistent with a 1,5°C trajectory for its overall operation.

However, ICT organizations may wish to establish a separate SBT associated with the scope 1 and 2 emissions arising from their support activities using, for example, the SBTi's existing relevant SDA

tools. In this case, only the scope 1 and 2 emissions associated with operating the ICT equipment should be used in the next step.

NOTE – Currently the SDA does not include a 1.5°C pathway, however this will be included in a future update to the SDA methodology.

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 (CC_b) by an emissions reduction factor (ERF). The emissions reduction factor is based on the appropriate sub-sector emission reduction pathway (see Figure 2) and the baseline and target years.

$$SBT_s = CC_b \,.\, ERF \quad (1)$$

Emission reduction factor 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 provide further guidance on scope 1-2 emissions.

8.1.5 Worked example

8.1.5.1 Target calculation

Consider a company with both mobile and fixed line operations.

The company selects 2019 as its baseline year and 2025 as its target year.

For both sub-sectors, the company decides to combine electricity related scope 1 and 2 emissions with those associated with support activities such as office buildings and/or a transport fleet.

The combined scope 1 and 2 emissions from running the mobile operations were 250 ktonnes CO_2e in the baseline year.

The combined scope 1 and 2 emissions from running the fixed operations were 150 ktonnes CO_2e in the baseline year.

Referencing the 2019 baseline and 2025 target years as shown in Tables III.1 to III.3 , the ERF for the mobile operations is found to be 0.794, and for the fixed operations 0.652.

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

$$\text{SBT (2025)} = 0.794 \times 250 + 0.652 \times 150 = 296.3 \text{ ktonnes } CO_2e$$

8.1.5.2 Expressing a target as an intensity

A fixed network operator has scope 1 and 2 emissions in the base year of 2019 of 150 ktCO2e and has 5 million subscribers. This is equivalent to an intensity metric of 30 kgCO2e per subscriber. For the target year of 2025, the absolute emissions target is 0.652 x 150 = 97.8 ktCO2e. The forecast number of subscribers for 2025 is 6 million, then the intensity target for 2025 is 97.8/6 = 16 kgCO2e per subscriber.

8.2 Setting a target for scope 3 emissions

The criteria for setting scope 3 targets are as described in the most recent SBTi criteria document. This ICT sector guidance does not set any additional criteria for scope 3 beyond the standard SBTi criteria. However, it encourages companies to refer to the ICT sector trajectories in clause 7.2 for associated scope 3 categories.

SBTi criteria require that a company sets a scope 3 target when its scope 3 emissions are 40% or more of its total scope 1, 2, and 3 emissions. The scope 3 target must cover at least 2/3 of total scope 3 emissions. For most ICT companies it is likely that the 40% criterion will be met, and the company will need to set a scope 3 target. Further, the most significant scope 3 categories for an ICT company are likely to be:

– Category 1 – Purchased goods and services; and

– Category 11 – Use of sold products.

However, companies should screen or calculate all scope 3 categories and based on the results, categories can be excluded as either being not applicable or because emissions are being immaterially small.

NOTE – The clarification regarding scope 3 categories is a complement to [SBTi 2020].

ICT organizations can set either a scope 3 emissions reduction target, or a supplier or customer engagement target, or a combination of the two.

For these categories, ICT organizations are encouraged to consider the trajectories given in clause 7.2 and [ITU-T L.1470] as references to define a scope 3 ambition level in line with the 1.5ºC trajectories of the ICT sector and its sub-sectors.

A full list of scope 3 categories described from an ICT sector perspective is available in Appendix IV.

Appendix I

The ICT sectoral target-setting methodology

I.1 Introduction to SBTi's standard sectoral decarbonisation approach

SBTi's standard sectoral decarbonisation approach (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 defined by a reduction in emissions relative to a specific business metric, such as production output of the company (e.g., tonnes CO_2e per tonne 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 as to how the sector will develop including its energy performance. This can be illustrated by the schematic diagram shown in Figure I.1.

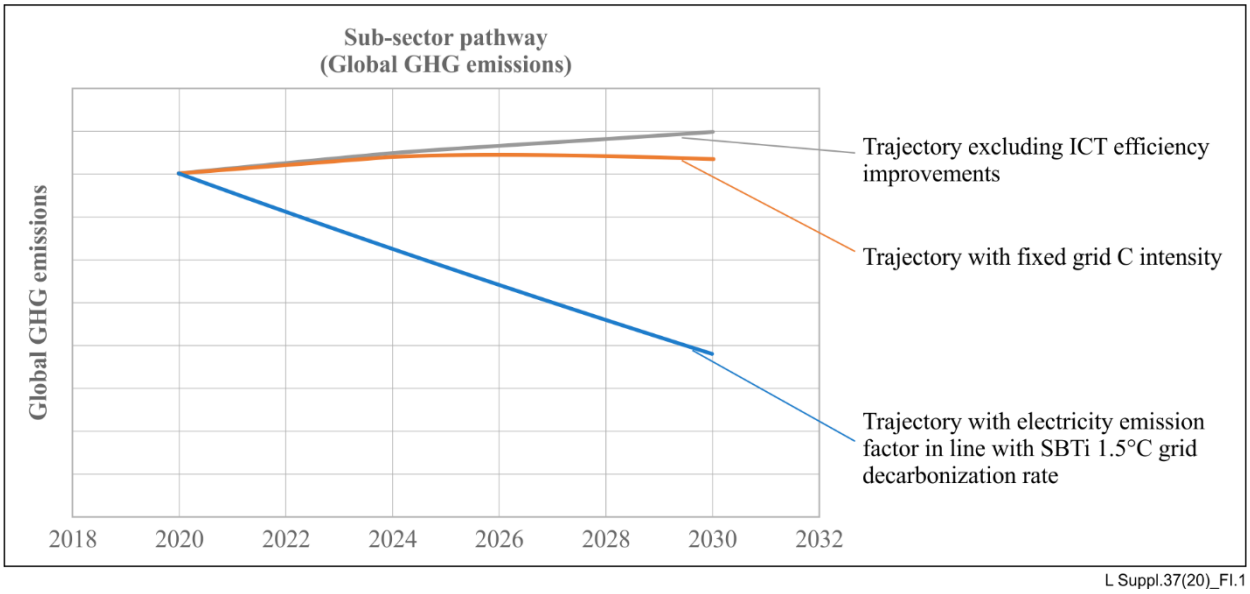

Figure I.1 – Trajectory development

In this illustrative, schematic diagram, the lower blue line represents a final ICT 1.5ºC trajectory which considers 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 decarbonise as required to comply with its own 1.5ºC trajectory and the ICT sector fails to mitigate that through power purchase agreements or investments in renewable supply. Additionally, the grey line shows what would happen if expected efficiencies in the ICT sector also fail to materialise.

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

To date, the existing sectors covered by SBTi's SDA tools [SBTi 2015] exclude any reference to ICT. Instead the SBTi Manual [SBTi 2019b] refers to computer, electronic, optical products and electrical equipment and places their manufacture in the 'All Other Industry' category and recommends this ICT sub-sector to set an absolute/intensity target in line with the absolute contraction approach.

With the publication of this guideline, SBTi establishes trajectories for the ICT sector which considers the situation of the following sub-sectors: mobile networks operators, fixed networks operators and data centres operators.

I.4 The main scope 1-2 emissions contributions

For ICT operators, emissions associated with the generation and subsequent use of electricity dominate their combined scope 1 and 2 footprints. The pathway associated with these emissions would therefore be 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 which results in the following absolute, rather than intensity-based, target trajectory according to:

$$C_{SBT,y} = CC_b \, . \, SC_{s,y} \, / SC_{s,b} \qquad \text{(I.1)}$$

Where:

CC_b CO_2 emissions of company in base year b (tCO_2)

$SC_{s,b}$ CO_2 emissions of sub-sector "s" in base year b (tCO_2)

$SC_{s,y}$ CO_2 emissions of sub-sector "s" in year y (tCO_2)

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 [b-MalmodinLundén 2018b]. The intensities for 2025, 2030 and 2050 are in line with the [b-IEA ETP] B2DS scenario remodelled by SBTi to align with [b-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 CO2e/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 those in the mobile sub-sector, often generate their own power on-site (for example, using diesel fuelled generators, PV panels, etc.). 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 above.

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 ($SC_{s,y}$) over the sub-sector's emissions in the base year ($SC_{s,b}$). This ratio is termed the emission reduction factor (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 five-year intervals. In order to calculate an ERF for every year between 2015 and 2030 a linear interpolation was taken across each five-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 as to 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 [SBTi 2015] methodology 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 MWhrs of electricity generation in a given year. For commercial buildings it is the floor area in m^2 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 the [SBTi 2015] methodology report, an ICT sub-sector pathway associated with use-phase electricity would follow:

$$SC_{s,y} = SA_{s,y} \,.\, SE_{s,y} \,.\, PI_y \qquad \text{(II.1)}$$

where:

$SA_{s,y}$	Activity in year y (Activity units) for ICT sub-sector s
$SE_{s,y}$	Energy intensity in year y (MWhrs/activity) for ICT sub-sector s
PI_y	Carbon Intensity for the power sector in year y (tCO_2/MWhr)
$SC_{s,y}$	Carbon emissions in year y (tCO_2)

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.

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

Where:

d	Initial company performance in the base year relative to the 2050 sector target (tCO2/activity)
CI_b	CO_2 intensity of the company in base year b (tCO_2/activity)
$SI_{s,2050}$	CO_2 intensity of the sub-sector s in year 2050 (tCO2/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[2] 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 (%)

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 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.

$$= if\ (m_y <= 1,\ m_y,\ 1) \quad \text{(II.4)}$$

As described above, 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 decarbonisation, 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 (tCO_2/activity)

$SI_{s,2050}$ CO_2 intensity of sub-sector s in target year 2050 (tCO_2/activity)

$SI_{s,b}$ CO_2 intensity of sub-sector s in base year b (tCO_2/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).

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

Where:

CI_y Intensity target of the company in year y (tCO_2/activity)

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

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

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.

[2] NOTE – 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 given above as follows:

Equation (II.2) now becomes:

$$d = CI_b \quad \text{(II.2a)}$$

Equation (II.5) becomes:

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

Equation (II.6) becomes:

$$CI_y = d \,.\, p_{s,y} \,.\, m_{s,y} \quad \text{(II.6a)}$$

In the case when the conditionality statement (II.4) is true ($m_y <= 1$), then equation (II.7) now extends to:

$$C_{SBT,y} = CI_b \,.\, (SI_{s,y} / SI_{s,b}).\, (CA_b / SA_{s,b}) / (CA_y / SA_{s,y}) \,.\, CA_y$$

$$C_{SBT,y} = (CI_b \,.\, CA_b) \,.\, (SI_{s,y} \,.\, SA_{s,y}) / (SI_{s,b} \,.\, SA_{s,b}) \quad \text{(II.7a)}$$

Otherwise written as:

$$C_{SBT,y} = CC_b \,.\, SC_{s,y} / SC_{s,b} \quad \text{(II.8a)}$$

Where:

CC_b CO_2 emissions of company in base year b (tCO_2)

$SC_{s,b}$ CO_2 emissions of sub-sector s in base year b (tCO_2)

$SC_{s,y}$ CO_2 emissions of sub-sector s in year y (tCO_2)

Or, in the case when the conditionality statement (II.4) is false ($m_y > 1$), then equation (II.7) extends to:

$$C_{SBT,y} = CI_b \,.\, (SI_{s,y} / SI_{s,b}).\, CA_y$$

$$C_{SBT,y} = (CC_b / CA_b) \,.\, (SC_{s,y} / SA_{s,y}) / (SC_{s,b} / SA_{s,b}) \,.\, CA_y \quad \text{(II.7b)}$$

Which is otherwise written as:

$$C_{SBT,y} = CC_b \,.\, SC_{s,y} / SC_{s,b} \,.\, (CA_y / SA_{s,y}) / (CA_b / SA_{s,b}) \quad \text{(II.8b)}$$

Where:

CC_b CO_2 emissions of company in base year b (tCO_2)

$SC_{s,b}$ CO_2 emissions of sub-sector s in base year b (tCO_2)

$SC_{s,y}$ CO_2 emissions of sub-sector s in year y (tCO_2)

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

$$C_{SBT,y} = CC_b \,.\, SC_{s,y} / SC_{s,b} / m_{s,y} \quad \text{(II.9)}$$

But in this case $m_{s,y}$ has already been forced to one 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

The emission reduction factors given in Tables III.1 to III.3 were derived from the trajectories described in clause 7.2. and can be used by operators to set a science based target (SBT) in line with this company guidance.

Table III.1 – Mobile networks operators

		Target Year							
		2023	2024	2025	2026	2027	2028	2029	2030
Base Year	2018	0,863	0,824	0,786	0,736	0,686	0,636	0,587	0,537
	2019		0,833	0,794	0,744	0,694	0,643	0,593	0,543
	2020			0,803	0,752	0,701	0,650	0,599	0,548
	2021				0,783	0,730	0,677	0,624	0,571
	2022					0,761	0,706	0,651	0,595
	2023						0,737	0,680	0,622
	2024							0,712	0,651
	2025								0,683

Table III.2 – Fixed networks operators

		Target Year							
		2023	2024	2025	2026	2027	2028	2029	2030
Base Year	2018	0,764	0,701	0,638	0,582	0,526	0,470	0,415	0,359
	2019		0,717	0,652	0,595	0,538	0,481	0,424	0,367
	2020			0,668	0,609	0,551	0,493	0,434	0,376
	2021				0,653	0,590	0,528	0,465	0,403
	2022					0,636	0,568	0,501	0,434
	2023						0,615	0,543	0,470
	2024							0,592	0,512
	2025								0,563

Table III.3 – Data centres operators

		Target Year							
		2023	2024	2025	2026	2027	2028	2029	2030
Base Year	2018	0,809	0,755	0,700	0,651	0,603	0,554	0,505	0,456
	2019		0,765	0,710	0,660	0,611	0,561	0,512	0,463
	2020			0,720	0,669	0,619	0,569	0,519	0,469
	2021				0,709	0,656	0,603	0,550	0,497
	2022					0,698	0,641	0,585	0,528
	2023						0,684	0,624	0,564
	2024							0,669	0,605
	2025								0,652

Appendix IV

ICT sector scope 3 categories

[ITU-T L.1420] provides guidance to ICT companies wanting to report their scope 1 to 3 emissions. It builds on and details [ISO 14064-2] and [b-GHG PI].Table IV.1 extracted from [ITU L.1420] summarizes the different scope 3 activities on the GHG protocol which are material from an ICT company perspective.

Table IV.1 – ICT sector scope 3 categories

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 3,19)
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; SF6 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 – ICT sector scope 3 categories

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 as well as the 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 as well as the results for employee commuting and other energy and/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	
S3K	Processing of sold	• Scope 1 and 2 during processing	

Table IV.1 – ICT sector scope 3 categories

	intermediate products		
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 8.3.5.1.3 [in 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.

Table IV.1 – ICT sector scope 3 categories

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. NOTE 19 – "Based on LCA" means that the full life cycle should be considered.			

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