

Draft Report of the EGTI Subgroup on National Greenhouse Gas Emission Monitoring Indicators for the ICT Sector

1. Context and objectives

The growing importance of the ICT sector in global energy consumption and greenhouse gas (GHG) emissions has led to increasing international attention on how to measure and monitor its environmental impact. Unlike sectors such as energy and transport, which benefit from well-established frameworks for emissions and energy tracking, reliable environmental data for the ICT sector remains largely unavailable. This data gap hampers effective policy development, regulatory oversight, and international comparability.

In this context, the EGTI Subgroup on National Greenhouse Gas Emission Monitoring Indicators was established following the 15th meeting of the Expert Group on Telecommunication/ICT Indicators (EGTI) in Geneva (September 2024). The subgroup was tasked with defining a set of harmonized environmental indicators to support national-level monitoring of the ICT sector's environmental impact. These indicators aim to strengthen countries' capacity to measure and monitor these impacts, enabling them to develop more informed policies. They also contribute to a broader effort by supporting the ITU's work in collecting harmonized country-level data and facilitating meaningful international comparisons. The subgroup's work aligns with ITU's broader strategic objectives, as outlined in Target 2.5 of the ITU Strategic Plan 2024–2027, which seeks to enhance the role of ICTs in climate and environmental action.

Six online meetings have been held with participants from all ITU regions: Africa (Uganda, South Africa, Zambia), Arab States (Comoros, Egypt), Asia and the Pacific (Malaysia, Philippines), CIS (Azerbaijan), Europe (Cyprus, France, Norway, Portugal, Greece, BEREC), and the Americas (Brazil, British Virgin Islands); the work was coordinated by the sub-group's Chair, Ms. Loïs Ponce (Arcep, France).

The indicators focus on key areas, including but not limited to:

- GHG emissions (Scopes 1, 2, and 3),
- Total energy and electricity consumption, and
- Use of renewable energy.

The subgroup also examined the feasibility of data collection in different national contexts, considering the availability of data and the capacities of both public authorities and private stakeholders. Emphasis was placed on ensuring that the indicators:

- Are already available and produced by the private sector, and/or can be produced, collected and reported by national entities (e.g. ICT regulators, statistical offices, environmental agencies),
- Can support both national and international monitoring efforts,
- Are flexible enough to accommodate different levels of data availability and institutional maturity,
- And contribute to improving data quality and comparability over time.

This report summarizes the subgroup's work to date and proposes a coherent framework of environmental indicators for the ICT sector. It reflects the input of subgroup members, presentations

of recent studies, initial country feedback via a questionnaire, and discussions on practical challenges related to data collection, data quality, and comparability. The report also outlines recommendations for future steps and potential avenues for collaboration with other international initiatives.

2. Work completed

a. Background Research and Initial Consultations

The subgroup began its work by reviewing existing research, regulatory approaches, and international initiatives relevant to environmental monitoring in the ICT sector. Several presentations were shared by members, including recent work from BEREC, ITU, and Arcep. These presentations provided valuable insights into the current landscape of environmental data collection and availability, ongoing standardization efforts, and existing practices in indicator development.

These external sources helped enrich and validate the framework of indicators proposed by the subgroup. In particular:

- Several indicators are found in the responses to the 2024 Monitoring ICT Sector GHG Emissions ITU pilot survey, the work of the ITU-D from the [‘Greening Digital Companies’](#) report and the ITU-World Bank 2025 [‘Measuring National ICT Sector Environmental Impact: Arcep Case Study, France’](#) report, the work of ITU-T Study Group 5 (ITU-T L.1472 forthcoming), the [BEREC report on environmental indicators](#), and Arcep’s national data collection efforts. This convergence justifies the inclusion of these indicators as central elements of the framework.
- In addition, the BEREC report introduced a prioritization approach that aligns with the subgroup's dual-priority methodology, supporting a phased and practical implementation strategy.

This cross-referencing ensured that the subgroup’s work is both complementary to existing efforts and aligned with international best practices, strengthening its relevance and applicability across diverse national contexts.

To better understand country-level realities, the subgroup also developed and circulated a questionnaire to national focal points. The objective was to gather information on:

- Existing environmental data collection practices in the ICT sector,
- National legal and institutional frameworks,
- Main challenges encountered in collecting and reporting data.

Despite the limited number of responses, (only three countries - Cyprus, Portugal, and the Philippines - replied), the feedback provided useful context. Responses reveal differing levels of maturity in environmental data collection within the ICT sector. Cyprus collects voluntary data from telecom operators without a legal mandate, while Portugal’s ANACOM engages in climate strategy coordination but lacks systematic ICT-specific data collection. The Philippines demonstrates a more integrated, multi-agency approach, with the Philippine Statistics Authority compiling national environmental statistics and the DICT beginning to track e-waste indicators. Across all three countries, key challenges include limited legal frameworks, capacity constraints, and the need for clearer inter-agency coordination. This feedback reaffirmed the need for a harmonized yet adaptable framework, supported by progressive implementation, capacity-building, and clear institutional responsibilities to

enhance the scope and reliability of data collection efforts. Norway and Brazil highlighted that they are currently initiating national collection of data, with Norway publishing its first results¹.

Based on these findings, as well as discussions within the subgroup, members reached broad consensus on several key aspects of the framework's design:

- The segmentation of the ICT sector into three major sub-sectors: telecom networks, data centers, and end-user device manufacturers;
- The use of selection thresholds to identify which companies should be surveyed in each country, based on their national relevance;
- A dual-priority system to rank indicators by environmental relevance and data collection feasibility, resulting in a phased priority list. The approach will begin with a limited set of high-impact indicators, with scope to expand as capacity and data availability grow nationally over time.

These points of agreement provided the foundation for the indicator framework proposed in the following section.

b. Indicator Development

The core output of the subgroup's work is a structured framework of environmental indicators designed to measure the climate and energy footprint of the ICT sector at the national level. The framework is structured in two tables:

¹ <https://nkom.no/hoeringer/rapport-digital-infrastruktur>

Table 1: Identification of stakeholders to be surveyed

This table defines which actors in the ICT sector should be surveyed for environmental data, based on their activity type, relevance, and national presence. Stakeholders are categorized by sub-sector: telecom networks, data centers, and end-user device manufacturers. Selection thresholds are proposed to limit the number of respondents and thus avoid an excessive burden on the entities responsible for data collection and exclude companies that are too small to provide meaningful data, while still ensuring representativeness.

Players to be surveyed and selection criteria

ICT sub-sector	Categories of players to be surveyed	Priority, depending on the country, for collecting data from the players under consideration [1]	Selection criteria for players to be surveyed [2]
Telecom networks (fixed and mobile)	Telecom operators	Priority 1 in all countries	Threshold based on the cumulative number of active subscribers or turnover, the selected operators must collectively cover $\geq 80\%$ of the national market share (in terms of active national subscribers or turnover)
Telecom networks (fixed and mobile)	Network equipment manufacturers	Priority 1 for countries in which network equipment manufacturers have plants located in that country, priority 2 for others	Threshold based on the turnover, the selected equipment manufacturers must collectively cover $\geq 80\%$ of the network equipment sold at national level, covering both fixed and mobile (can have different market-share thresholds). Data should be collected from all licensed, facilities-based fixed and mobile operators.
Data centers	Data center operators, including cloud providers	Priority 1 in all countries	Threshold based on the IT power installed, the selected data center operators or cloud provider must collectively cover $\geq 80\%$ of the total IT power installed at national level
End-user devices	End-user device manufacturers	Priority 1 for countries in which end-user devices manufacturers have plants	Threshold based on the turnover, the selected end-user device manufacturers must collectively cover $\geq 80\%$ of the end-user devices sold at national level

Players to be surveyed and selection criteria

ICT sub-sector	Categories of players to be surveyed	Priority, depending on the country, for collecting data from the players under consideration [1]	Selection criteria for players to be surveyed [2]
		located in that country, priority 2 for others	

[1] The players to be considered are not the same depending on the country and the activity of these players in the country. For each type of player, the corresponding section indicates in which case and with which priority the players should be taken into account.

[2] To avoid burdening the entity in charge of data collection and soliciting too small companies, which would not have the necessary resources to provide the data requested, it is recommended that thresholds be defined. These thresholds should limit the number of companies to be surveyed, while ensuring that the companies selected are representative of the overall market. Note: In most countries, there are typically 3-4 major telecom operators. Priority should be given to collecting data from those with the highest market share nationally. For example, include all operators with $\geq 10\%$ of individual market share, until a cumulative market coverage of 80% is reached, which can be adjusted depending on national market structure. It is also recommended that the entity in charge of data collection should start with the telecom sector first in cases where the entity responsible for data collection is the country's telecommunications regulator, following the recommendation in the ITU-World Bank 2025 [‘Measuring National ICT Sector Environmental Impact: Arcep Case Study, France’](#) report.

Table 2: Indicator matrix

The second section proposes a set of environmental indicators to be collected from each stakeholder group. Each indicator is assigned:

- A priority score for environmental relevance (1 = high relevance, 3 = lower),
- A priority score for feasibility of data collection (1 = high feasibility/availability, 3 = low).

This dual-priority system allows countries to progressively build their data collection capacity by focusing first on indicators that are both impactful and achievable, while planning for the inclusion of more complex indicators over time.

Player concerned	Category	Indicator	Priority for environmental relevance	Priority for feasibility of data collection	Comments and definitions where applicable ²
All	Carbon	Scope 1 GHG emissions (tCO ₂ e)	1	1	Most companies follow the GHG Protocol Corporate Accounting and Reporting Standard for calculating their CO ₂ e emissions. ³ The standard identifies three scopes in reference to GHG emissions. Scope 1 are direct emissions from sources owned or controlled by an organization, resulting directly from company operations, such as the use of diesel (e.g. in on-site diesel generators) and other fuels.
All	Carbon	Scope 2 GHG emissions (location-based)	1	1	Indirect emissions linked to electricity from the generation of purchased electricity, heat, or steam consumed by the reporting entity, calculated using the average emissions intensity of the grid where the energy consumption occurs.
All	Carbon	Scope 2 GHG emissions (market-based) (tCO ₂ e)	2	1	Indirect greenhouse gas emissions from the generation of purchased electricity, heat, or steam, calculated using supplier-specific emission factors or contractual instruments (e.g., renewable energy certificates, power purchase agreements) chosen by the reporting entity. Could be rank 1, given that market-based scope 2 emissions are frequently published by companies carrying out a carbon footprint. They have been

² Definitions are provided for Scope 1-3 emissions in accordance with the GHG Protocol Accounting and Reporting Standard. Additional definitions of indicators will be added in the next cycle of the work of the sub-group.

³ World Business Council for Sustainable Development and World Resources Institute. 2004. A Corporate Accounting and Reporting Standard (Revised Edition). <https://ghgprotocol.org/corporate-standard>

Player concerned	Category	Indicator	Priority for environmental relevance	Priority for feasibility of data collection	Comments and definitions where applicable ²
					classified as rank 2 to emphasise that they are complementary to location-based scope 2 emissions, and that they should not be collected alone, without also having the location-based data
All	Carbon	Scope 3 GHG emissions (tCO ₂ e)	2	3	<p>Corporate value chain, or Scope 3, emissions are upstream and downstream emissions arising from company activities. This would include, for instance, suppliers that ICT manufacturing companies outsource to for their production needs. It also includes product use emissions from devices such as computers and smartphones manufactured by ICT companies. There are 15 categories of Scope 3 emission.</p> <p>More difficult to collect because the players involved have varying levels of maturity in terms of calculating and completing the different emissions categories in scope 3. In addition, scope 3 cannot be aggregated directly between players. But it is still important to collect scope 3, to encourage companies to calculate it accurately, and to understand the emissions sources upstream and downstream of their activities, so as to better target ways of reducing their carbon footprint.</p> <p>Scope 3 should not be treated as a single aggregated value, but be disaggregated by relevant categories in line with the GHG Protocol.</p>

Player concerned	Category	Indicator	Priority for environmental relevance	Priority for feasibility of data collection	Comments and definitions where applicable ²
					<p>Priority levels per sub-category enables countries to progressively build capacity and focus first on areas with the highest environmental impact. It is recognized that some categories may not be aggregatable or may introduce double-counting risks. Priority should be first given to:</p> <p>Category 1: Purchased goods and services</p> <p>Category 2: Capital goods</p> <p>Category 8: Upstream leased assets (tower companies play an important role in some markets so should be evaluated)</p> <p>Category 11: Use of sold products</p>
All	Energy	Total renewable/low-carbon energy consumption (MWh)	1	1	
All	Energy	Breakdown of total renewable energy consumption by source (PPAs, guarantees of origin, on-site) (MWh)	2	2	Quality of the renewable sources used
All	Energy	Total electricity consumption (MWh)	1	1	
All	Energy	Total renewable electricity consumption (MWh)	1	1	
Telecom operators	Energy	Total energy consumption of telecom networks (MWh)	1	1	Overall energy consumption of telecoms networks facilities
Telecom operators	Energy	Breakdown of total network energy consumption between	2	2	

Player concerned	Category	Indicator	Priority for environmental relevance	Priority for feasibility of data collection	Comments and definitions where applicable ²
		fixed and mobile networks (MWh)			
Telecom operators	Energy	Breakdown of the fixed and mobile network energy consumption by technology (fiber/ADSL or 2G/3G/4G/5G) (MWh)	3	3	Not easy to classify between the different technologies.
Telecom operators	Energy	Total electricity consumption of the set-top boxes and internet boxes used by operators' customers (MWh)	1	3	
Network equipment manufacturers	Energy	Total energy consumption of plants for the manufacture of equipment and breakdown by plant (MWh)	1	2	Site breakdowns and plant locations are essential for identifying where a country's major energy consumers are located and for resilience/network planning
Network equipment manufacturers	Others	Total water consumption of plants for the manufacture of equipment and breakdown by plant (MWh)	1	3	The breakdown by site and the location of plants are essential for knowing where a country's major water consumers are, in a context where water is becoming a critical resource as a result of global warming
Network equipment manufacturers	Others	Total potable water consumption of plants for the manufacture of equipment (m ³)	1	3	
Network equipment manufacturers	Others	Location of plants	1	1	
Network equipment manufacturers	Others	Volume of precious metals and rare earth elements used	1	3	Difficult to collect this information hence priority 3.

Player concerned	Category	Indicator	Priority for environmental relevance	Priority for feasibility of data collection	Comments and definitions where applicable ²
		to manufacture equipment (kg)			
Data center operators	Energy	Total energy consumption of all the data centers in operation and the breakdown by site (MWh)	1	1	Site breakdowns and data centre locations are essential for identifying where a country's major energy consumers are located and for resilience/network planning
Data center operators	Energy	Total electricity consumption of IT equipment in all data centres in operation and breakdown by site (MWh)	1	2	
Data center operators	Others	Total water consumption of data centers in operation and breakdown by site (m ³)	1	2	The breakdown by site and the location of data centres are essential for knowing where a country's major water consumers are, in a context where water is becoming a critical resource as a result of global warming
Data center operators	Others	Total water consumption of data centers breakdown by site (m ³)	1	3	
Data center operators	Others	Total potable water consumption of data centers in operation (m ³)	1	2	
Data center operators	Others	Total potable water consumption of data centers breakdown by site (m ³)	1	3	
Data center operators	Others	Location of data centers	1	1	
End-user devices manufacturers	Energy	Total energy consumption of plants for the manufacture of end-user devices and breakdown by plant (MWh)	1	1	Site breakdowns and plant locations are essential for identifying where a country's major energy consumers are located and for resilience/network planning

Player concerned	Category	Indicator	Priority for environmental relevance	Priority for feasibility of data collection	Comments and definitions where applicable ²
End-user devices manufacturers	Others	Total water consumption of plants for the manufacture of end-user devices (m ³)	1	2	The breakdown by site and the location of plants are essential for knowing where a country's major water consumers are, in a context where water is becoming a critical resource as a result of global warming
End-user devices manufacturers	Others	Total water consumption of plants for the manufacture of end-user devices breakdown by plant (m ³)	1	3	
End-user devices manufacturers	Others	Total potable water consumption of plants for the manufacture of end-user devices (m ³)	1	3	
End-user devices manufacturers	Others	Location of plants	1	2	The location is sometimes sensitive so not everyone will disclose, exact location is not mandatory (city level recommended).
End-user devices manufacturers	Others	Volume of precious metals and rare earth elements used to manufacture end-user devices (kg)	1	3	
Data center operators	Energy	Power Use Effectiveness (national mean)	2	3	Power Usage Effectiveness is a widely used metric to assess energy efficiency in data centers. Unique per data center, national mean recommended to collect instead of per data centre for feasibility. 1.0 implies perfect efficiency, 1.1 - 1.5 very efficient, >2.0 is inefficient.
Data center operators	Other	Number of data centres operating nationally	1	1	Number of data centres at the national level. Useful to have the geographical coverage to adapt infrastructure planning.

Complementary notes on actor coverage and scope 3 indicators:

Regarding the categories of actors identified in Table 1, it was mentioned during the last meetings of the subgroup that software service providers could also be considered relevant stakeholders. However, these actors have not been included in the current version of the framework, as the group did not have the opportunity to discuss which types of indicators would be appropriate (relevant and feasible to collect) for this category. Additionally, the external sources reviewed during the subgroup's work did not provide references or guidance related to environmental indicators for software service providers. Nonetheless, the inclusion of these actors may be considered in future iterations of the framework, in line with the subgroup's recommended progressive approach to data expansion and refinement.

Regarding the indicators presented in Table 2, discussions also took place among subgroup members on the possible inclusion of disaggregated Scope 3 emission categories. Some members emphasized the relevance of Scope 3 emissions, as they can represent a significant portion of a company's overall carbon footprint, and breaking down Scope 3 into categories can help identify major emission drivers, which is essential for setting and monitoring corporate emission reduction targets. At the same time, it was noted that these indicators may be less aligned with the subgroup's primary objective, which is to enable countries to collect data in order to gather data by country and supporting comparability between countries. Indeed, Scope 3 indicators present notable challenges: they are difficult to aggregate across companies without introducing double counting, and there are varying levels of maturity among companies in calculating Scope 3 emissions, and inconsistency in the categories covered by different stakeholders. For these reasons, Scope 3 categories have not been included at this stage of the framework. However, this point remains open for further discussion..

In the case of integrating scope 3 categories into the indicator framework, it would be wise to set priority levels for each sub-category to allow countries to build capacity gradually while focusing first on areas with the highest environmental impact. Emphasis should be placed on the following:

- Category 1: Purchased Goods and Services
- Category 2: Capital Goods
- Category 8: Upstream Leased Assets (e.g., tower companies)
- Category 11: Use of Sold Products

Category 8 is important in developing markets where tower companies, though not owned by operators, contribute to energy use and emissions. These should be explicitly included in data collection efforts. Note that reporting inconsistencies exist e.g. some operators, classify tower emissions under Category 1 instead of 8. Clear guidance is needed to ensure consistency. Category 11 should also be captured, at least for emissions from leased end-user devices (e.g., set-top boxes, routers), which can be significant over time.

Regulators should be aware of existing climate-related reports published by operators. These reports often contain valuable data on emissions, energy consumption, and sustainability practices. Where feasible, regulators could begin compiling and analyzing this information to inform national reporting systems. This would provide an early opportunity to assess the availability, quality, and consistency of relevant data, while also helping identify potential gaps or alignment needs with the proposed indicator framework.

3. Next steps and recommendations

A major limitation in the current phase of work was the low response rate to the questionnaire sent to countries, with only three countries (Cyprus, Portugal, and the Philippines) providing input. This restricted the group's ability to assess regional diversity and practical feasibility.

To address this, the subgroup recommends extending the duration of its work to allow for broader outreach and engagement. This could involve renewed communication with Member States and targeted follow-up with underrepresented regions. Such actions are particularly important, as the success of the indicator development depends on the active engagement and contribution of a wide range of Member States.

At present, the indicator framework remains largely theoretical. Indeed, while it is grounded in recent studies and data collection already implemented by a few countries and validated through subgroup discussions, for most countries it has not yet been tested through actual data collection processes. To move from theory to practice, the subgroup recommends developing a dedicated questionnaire based on the indicators outlined in Table 2 to facilitate data collection and launching pilot data collection via the questionnaire in volunteer countries, particularly in those that have already initiated data collection works, in order to gather their experiences regarding the feasibility of using the proposed indicator framework.

These pilot exercises would serve multiple purposes:

- Test the feasibility of the proposed indicators in real national contexts;
- Identify barriers to data collection, such as access to company-level data, technical gaps or legal issues;
- Assess the resources and capacity required for regular reporting. This includes identifying the national entity responsible for collecting data (e.g. this might be the telecommunications regulator or another relevant national entity) and determining the resources needed for effective coordination;

The work on the refinement and piloting of the indicators should be informed by the outcomes of the data collection carried out under the ITU-T Study Group 5 pilot project, which is based on ITU-T Recommendation L.1472. Similarly, the outcomes of the subgroup's own pilot activities could be shared with ITU-T Study Group 5 to ensure alignment. Indeed, many indicators identified by the subgroup are included in L.1472 (e.g. energy consumption and emissions). There may be a good timing match, as the ITU-T project is starting interviews with companies in August-September 2025, and will move to country-level interviews later, coordination could avoid duplication and support global harmonization. This work will also feed into an ITU-D project on 'Advancing Green Digital Transformation for a Net-Zero ICT Sector' which aims to develop a data collection guideline.