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EU Code of Conduct for the sustainability of telecommunications networks

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Contents

Executive summary

This EU Code of Conduct (CoC) for the sustainability of telecommunications networks is a deliverable under the European Commission's 2022 Digitalising the Energy System Action Plan[1]. In line with the Action Plan and other EU policies, environmental sustainability of telecommunications networks should contribute to achieving the EU's climate targets. Stakeholders can assess environmental sustainability during the design, manufacturing, deployment, operation, maintenance, audit and decommissioning phases. These assessments should follow the best practices based on standards, as set out in this EU CoC, with a particular focus on the operation phase.

After exploring the possibility to develop common indicators for measuring the environmental footprint, as required under the 2022 Action Plan (EC JRC 2023b), eight indicators were selected for this EU CoC to cover energy, climate, and other environmental aspects of sustainability most relevant in the context of telecommunications networks.

A set of expected and optional practices are defined, both at the level of the entire network infrastructure and for specific network segments, to the extent possible.

Each practice is based on a standard or set of complementary standards, which focus notably on the definition of organisational rules and processes as well as technical specifications for the collection, analysis and reporting of environmental sustainability data.

The expected practices laid out in this EU CoC could feed into the development of technical screening criteria to assess a substantial contribution of telecommunications networks to climate change mitigation under the EU Taxonomy Regulation[2].

The scope of this EU CoC addresses electronic communications networks in the sense of Art. 2(1) Directive (EU) 2018/1972 (the European Electronic Communications Code) for the provision of electronic communications services. Focused on the most relevant aspects for the environmental sustainability of telecommunications networks (based on EC JRC 2023b), this EU CoC does not address aspects of biodiversity, water-use, pollution, land-use, working conditions, communities' economic, social and cultural rights, social inclusion of consumers and business conduct, as covered by the broader and horizontal European Sustainability Reporting Standards (ESRS) (EC 2023a).

Regarding the different phases of the network infrastructure lifecycle, i.e. design, manufacturing, deployment, operation, maintenance, audit and decommissioning (e.g., the process of removing the equipment from service), this EU CoC is especially focused on the operation phase, where standards are most mature, while however also identifying potentially relevant practices for the other phases (e.g., for circular economy aspects like e-waste). As standards for these practices mature, the currently optional practices defined in this document may become expected under future iterations of this EU CoC.

Acknowledging the difficulties of comparing network infrastructures with each other, which would require accounting for factors such as geographical topology, population density, and network license requirements, this EU CoC is focused on measuring improvements of any network infrastructure over time, providing a common methodology across the EU.

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[1] Communication COM/2022/552 from the Commission to the European Parliament, the Council, the European economic and Social Committee and the Committee of the regions, "Digitalising the energy system - EU action plan." See also the EC webpage "Key actions for digitalising energy," at: https://energy.ec.europa.eu/topics/eus-energy-system/digitalisation-energy-system/key-actions-digitalising-energy_en (last accessed: November 2025).

[2] Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088, OJ L 198, 22.6.2020, p. 13–43.

In addition, it is recognised that measuring energy consumption at the level of individual technologies or specific network components introduces a level of granularity and complexity that may currently not be widely available across operators. This limitation should be considered when interpreting results and applying standards.

Reporting organisations strive for assessing progress towards the EU's climate targets through implementing the expected practices laid out in this EU CoC. Additional optional practices provide indications on how reporting organisations could further measure reductions in their environmental footprint. As the standardisation landscape evolves, optional practices may become expected practices in future iterations of this EU CoC. Reporting organisations complying with this EU CoC commit to implementing the relevant tracking mechanisms during 2026, making public first data points gathered under this EU CoC on a best-effort basis and sharing lessons learned by Q2 2027. This will allow making public the first full-year data points for fiscal year 2027 in 2028, in line with the publication requirements for fiscal year reporting laid down in the sustainable finance framework, once revised3.

In order to provide flexibility and acknowledge potential implementation challenges, particularly in the initial phase until Q2 2027, reporting organisations are expected to apply the practices presented in this EU CoC on a best-effort basis, relying on internal methodologies for measurements, estimations, and evaluations based on the best available information.

Reporting organisations should always use the most recent version of any of the standards suggested in this EU CoC (i.e., a mere update of a standard after the publication date of this EU CoC does not require a revision of this EU CoC). The application of the EU CoC should not be constrained by third-party criteria. For example, in case of diverging interpretations between a reporting organisation and an external auditor regarding the data to be gathered under this EU CoC, the reporting organisation's interpretation should prevail. Standardisation bodies should update the respective standards to ensure a consistent interpretation. The Commission, consulting with stakeholders, will regularly review and, if it deems necessary, update this EU CoC to address issues of diverging interpretations and to reflect the evolving standardisation landscape in current and future practices.

[3] Commission simplifies rules on sustainability and EU investments, available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_25_614 (last accessed: Nov. 2025).

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1 Introduction

The Information and Communication Technology (ICT) sector is an essential component of the digital society but also contributes to Greenhouse Gas (GHG) emissions. Different sources provide different estimates. In (EC 2022a), it is estimated that the ICT sector – including data centres, telecommunications networks, and connected devices – accounts for 2-4% of the global GHG emissions (of which networks contribute up to 24%), between 7% and 9% of global electricity consumption (forecast to rise to 13% by 2030), and for increasing amounts of e-waste. At the same time, it should also be noted that ICT digital technology can help cut global greenhouse gas emissions by 15% if properly used and governed[4]. It is also reported that telecommunications networks account for around 1% of total electricity use in the EU[5].

This document addresses electronic communications networks (ECNs) in the sense of Art. 2(1) Directive (EU) 2018/1972 (the European Electronic Communications Code)[6] for the provision of electronic communications services (ECSs), referred to as telecommunications networks, in line with the Commission's 2022 Digitalising the Energy System Action Plan (EC 2022b). Telecommunications networks represent a significant segment of the ICT sector and the analysis of their energy, climate and environmental footprint may help to decrease the negative impacts on our planet. To support this analysis, it is important to develop common indicators that can be turned into best practices and an auditing framework that enables to monitor and benchmark environmental sustainability based on objectively measurable data, as envisaged by the Action Plan. In March 2024, the Commission delivered on developing common indicators with the in-depth JRC Technical Report JRC136475 (EC JRC 2023b).

The report on environmental sustainability indicators laid the ground for a selection of eight indicators (GHG indicators are grouped into one category) to be turned into an EU Code of Conduct (CoC) for the sustainability of telecommunications networks, in line with the Action Plan:
1: Energy Consumption
2: Energy Efficiency
3: GHG Scope 1, Scope 2, Scope 3
4: Renewable Energy
5: E-waste
6: Distribution or utilisation of recycled/ refurbished/ reused products

In its 2024 White Paper on "How to master Europe's digital infrastructure needs" (EC 2024), the Commission announced that it would "engage with the industry to further improve the usability and potential scope of the EU Taxonomy for green investment in electronic communications networks ensuring it is built upon robust and credible science-based metrics". This recognises the need to attract investments into environmentally sustainable telecommunications infrastructures.
This EU CoC aims to be a reference point for public and private decision-makers towards a more aligned approach on environmental sustainability in telecommunications networks across the EU (see Section 1.4).

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4 World Economic Forum 2019, https://www.weforum.org/stories/2019/01/why-digitalization-is-the-key-to-exponential-climate-action/ (last accessed: November 2025).

5 Kamiya, G. and Bertoldi, P., "Energy Consumption in Data Centres and Broadband Communication Networks in the EU," Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/706491, JRC135926., available at: https://publications.jrc.ec.europa.eu/repository/handle/JRC135926 (last accessed: November 2025).

6 Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code, https://eur-lex.europa.eu/eli/dir/2018/1972/oj (last accessed: November 2025).

1.1 Definitions

The following table provides the definitions of the terms used in this report together with the source of the definition.

Table 1. Definitions of the terms used in this document

Term	Definition	Source
Accreditation	Third-party attestation related to a conformity assessment body, conveying formal demonstration of its competence, impartiality and consistent operation in performing specific conformity assessment activities.	ISO 17000
Accreditation body	Authoritative body that performs accreditation.	ISO 17000
Assessor	Person assigned by an accreditation body to perform, alone or as part of an assessment team, an assessment of a conformity assessment body.	ISO 17011
Attestation	Issue of a statement, based on a decision that fulfilment of specified requirements has been demonstrated.	ISO 17000
Audit	Process for obtaining relevant information about an object of conformity assessment and evaluating it objectively to determine the extent to which specified requirements are fulfilled.	ISO 17000
Auditor	Person who conducts an audit	ISO 17000
Best practice	A documented process, product, or procedure that has been shown to be effective and generally accepted for achieving sustainable outcomes.	ISO 9000
Certification	Third-party attestation related to an object of conformity assessment, with the exception of accreditation.	ISO 17000
Circular scoring	Circular scoring is a metric to measure the circularity of an ICT good or system along three dimensions: 1) the ICT good durability, 2) the ICT good ability to be recycled, repaired, reused and upgraded, and 3) the manufacturers ability to recycle, repair, reuse and upgrade the ICT good put into the market.	Own definition based on ITU-T L.1023 content
Conformity assessment	Demonstration that specified requirements are fulfilled. Conformity assessment includes (but it is not limited) to the following list of activities: testing, inspection, validation, verification and certification, as well as the accreditation of conformity assessment bodies.	ISO 17000

Conformity assessment body	Body that performs conformity assessment activities, excluding accreditation.	ISO 17000
Conformity assessment programme	Set of rules and procedures that describes the objects of conformity assessment, identifies the specified requirements and provides the methodology for performing conformity assessment.	ISO 17000
Customer-premises equipment (CPE)	Any terminal and associated ICT goods located at a subscriber's premises and connected with a carrier's telecommunication channel(s) at the NTPs CPE covers also home office goods. CPE is not in the scope of this EU CoC.	ETSI ES 203 199
Documented information	Information required to be controlled and maintained by an organisation and the medium on which it is contained. For example, it can be a technical report describing the impact of a network sub-component for a specific indicator.	ISO 55000
Electronic Communications Networks (ECN)	Electronic communications network means transmission systems, whether or not they are based on a permanent infrastructure or centralised administration capacity, and, where applicable, switching or routing equipment and other resources, including network elements which are not active, which permit the conveyance of signals by wire, radio, optical or other electromagnetic means, including satellite networks, fixed (circuit- and packet-switched, including internet) and mobile networks, electricity cable systems, to the extent that they are used for the purpose of transmitting signals, networks used for radio and television broadcasting, and cable television networks, irrespective of the type of information conveyed.	Directive (EU) 2018/1972[6]
Environmental impact	Impact including positive and negative aspects on the environment.	ETSI ES 203 199
Equipment facility	Building that, which hosts the telecommunications equipment of the reporting organisation.	Own definition

E-waste	E-waste is also known as waste electrical and electronic equipment (WEEE) and it means electrical or electronic equipment which is waste (i.,e, any substance or object which the holder discards or intends or is required to discard), including all components, sub-assemblies and consumables which are part of the product at the time of discarding.	Own definition based on Directive 2008/98/EC[7]
Fixed Access Network (FAN)	Access network provided by telecommunications operators comprising optical fibre and metallic cabling providing direct connection to customer premise	EN 305 174-1 V1.1.1
GHG Scope 1: Carbon emissions - Energy direct emissions	GHG Scope 1 Carbon emissions - Energy direct emissions are Greenhouse gas (GHG) emissions from owned or controlled sources.	ITU-T L.1450
GHG Scope 2: Carbon emissions - Energy indirect emissions	GHG Scope 2 Carbon emissions - Energy indirect emissions are greenhouse gas (GHG) emissions from the generation of electricity, heat or steam that has been purchased by the reporting organisation, e.g., indirect emissions from electricity use or energy bought for heating, cooling, network operations and data centre operations, produced on a company's behalf.	ITU-T L.1450
GHG Scope 3: emissions	GHG Scope 3 emissions are defined as any other indirect greenhouse gas (GHG) emissions from sources that are located along the reporting organisation's value chain. These are emissions that are not associated with the operator itself but which the reporting organisation is indirectly responsible for, up and down its value chain.	ITU-T L.1450
Information	Meaningful result of organising and processing data.	ISO 55000
Lifetime	A duration which may correspond to commercial lifetime, operating lifetime, extended operating lifetime or depreciation lifetime.	ETSI ES 203 199

[7] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, https://eur-lex.europa.eu/eli/dir/2008/98/oj

National Regulatory Authorities (NRA)	Competent Member State authorities implementing Directive (EU) 2018/1972 and Regulation (EU) 2015/2120.	Directive (EU) 2018/1972[6] and Regulation (EU) 2015/2120[8]
Network energy consumption	Overall electric energy consumption of an electronic communications network and its equipment.	Own definition based on ETSI ES 203 228
Network energy efficiency	Relation between the useful output and energy/power consumption	ETSI ES 203 228
Network Functions Virtualisation (NFV)	Principle of separating network functions from the hardware they run on by using virtual hardware abstraction	ETSI GR NFV 003 v.1.5.1
Network termination point (NTP)	Point established in a building or complex to separate CPE from telephone company goods.	ETSI ES 203 199
Operator	Organisation operating networks and services.	ETSI ES 203 199
Radio Access Network (RAN)	Telecommunications network in which the access to the network (connection between user terminal and network) is implemented without the use of wires and that is part of GERAN, UTRAN or E-UTRA networks defined by 3GPP and 5G (New Radio – NR)	Modified from ETSI ES 203 228 v.1.4.1
Recycling	Any recovery operation by which waste materials are reprocessed into products, materials, or substances, whether for the original or other purposes. This includes the reprocessing of organic material but excludes energy recovery and the reprocessing into materials intended for use as fuels or for backfilling operations.	Directive (EU) 2022/2464[9]
Refurbishment	Actions carried out to prepare, clean, test, service and, where necessary, repair a product or a discarded product in order to restore its performance or functionality within the intended use and range of performance originally conceived at the design stage at the time of the placing of the product on the market.	Regulation (EU) 2024/1781[10]

[8] Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 laying down measures concerning open internet access and amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services and Regulation (EU) No 531/2012 on roaming on public mobile communications networks within the Union, https://eur-lex.europa.eu/eli/reg/2015/2120/oj (last accessed: November 2025).

[9] Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting, https://eur-lex.europa.eu/eli/dir/2022/2464/oj (last accessed: November 2025).

[10] Regulation (EU) 2024/1781 of the European Parliament and of the Council of 13 June 2024 establishing a framework for the setting of ecodesign requirements for sustainable products, https://eur-lex.europa.eu/eli/reg/2024/1781/oj (last accessed: November 2025).

Renewable energy	Energy from renewable sources' as energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.	EN 305 200-2-3
Reporting organisation	Organisation that reports on its environmentally sustainable economic activities in accordance with this EU Code of Conduct.	Own definition
Reuse	Any operation by which products and components that are not waste are used again for the same purpose for which they were conceived. This may involve cleaning or minor adjustments, so they are ready for the next use without significant modification.	Directive (EU) 2022/2464
Standard	A document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.	ETSI[11] (Derived from ISO/IEC Guide 2:1996, definition 3.2)
Supply chain	Linked set of resources and processes between and among multiple levels of an enterprise, each of which is an acquirer that begins with the sourcing of products and services and extends through the product and service life cycle.	ETSI TR 103 937
Third-party conformity assessment activity	Conformity assessment activity that is performed by a person or organisation that is not the provider of the object of the assessment (e.g., the network infrastructure) and has no user interest in the object.	ISO 17000
Traffic	Total volume of cells, blocks, frames, packets, calls, messages, bytes or other units of data carried over a circuit or network, or processed through a switch, router or other system.	ETSI ES 203 199
User	A human or a machine using a communication service.	Inspired from ETSI TR 102 643
Verification	Confirmation of truthfulness through the provision of objective evidence that specified requirements have been fulfilled.	ISO 17000

[11] ETSI webpage "Why standards," https://www.etsi.org/standards/why-standards (last accessed: November 2025).

Source: JRC analysis

1.2 Policy and regulatory context

This EU CoC considers the regulatory landscape already framed for Green Deal, Circular Economy and EU Taxonomy. A comprehensive review was already provided in the JRC report JRC136475 (EC JRC 2023b) and is not repeated here. This section aims to give an update on the recent regulatory developments in this context in comparison to what is described in JRC136475.

1.2.1 Corporate Sustainability Reporting Directive

The disclosure of corporate sustainability information is addressed by Directive (EU) 2022/2464, known as the Corporate Sustainability Reporting Directive (CSRD) (EC 2022). The CSRD aims at improving the flow of sustainability information in the corporate world.
The CSRD obliges certain companies to report sustainability information as a part of their annual management report. The CSRD also stipulates that the collection of sustainability information is to be conducted through independent auditing. On 26 February 2025, the Commission adopted an Omnibus simplification package[12] including proposals to amend the CSRD (see Section 1.2.3). Sustainability disclosure concerns the following environmental factors:

(a) climate change mitigation, including scope 1, scope 2 and, where relevant, scope 3 greenhouse gas (GHG) emissions. Scope 1 emissions are direct emissions, scope 2 emissions are indirect emissions from the use of purchased energy and scope 3 emissions are all other indirect emissions that occur across the value chain and are outside of the organisation's direct control.

(b) climate change adaptation;

(c) use of water and marine resources;

(d) use of resource and the circular economy;

(e) pollution (non-GHG);

(f) biodiversity and ecosystems.

The CSRD considers also social and governance aspects of sustainability.

1.2.2 EU Taxonomy Regulation

The EU Taxonomy Regulation (Regulation (EU) 2020/852) and notably its Commission Delegated Regulation (EU) 2023/2485[13], which is a targeted amendment to the Climate Delegated Act[14],

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12 Commission simplifies rules on sustainability and EU investments, delivering over €6 billion in administrative relief, https://finance.ec.europa.eu/publications/commission-simplifies-rules-sustainability-and-eu-investments-delivering-over-eu6-billion_en (last accessed: November 2025).

13 Commission Delegated Regulation (EU) 2023/2485 amending Delegated Regulation (EU) 2021/2139 establishing additional technical screening criteria for determining the conditions under which certain economic activities qualify as contributing substantially to climate change mitigation or climate change adaptation and for determining whether those activities cause no significant harm to any of the other environmental objectives.

14 Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives, https://eur-lex.europa.eu/eli/reg_del/2021/2139/oj (last accessed: November 2025).

establishes technical screening criteria for determining the conditions under which certain economic activities qualify for the following objectives:

- contributing substantially to climate change mitigation;
- contributing substantially to climate change adaptation.

In addition, Commission Delegated Regulation (EU) 2023/2486, known as Environmental Delegated Act[15], establishes the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to one of the following objectives:

- sustainable use and protection of water and marine resources;
- transition to a circular economy;
- pollution prevention and control;
- protection and restoration of biodiversity and ecosystems.

As data becomes increasingly available, the benefits from applying the Taxonomy and the rest of the sustainable finance framework are expected to become more evident.
To be considered taxonomy-aligned, an economic activity has to make a substantial contribution set out in the Taxonomy Regulation and do not significantly harm any of the other objectives.

It is to be noted that telecommunications networks are currently not specifically covered by the EU Taxonomy[16]. See also the EU Taxonomy compass (EC 2023b).

1.2.3 Commission Sustainability Omnibus Proposal

In his report on the Future of European Competitiveness[17], Mario Draghi emphasised the need for Europe to create a regulatory landscape which facilitates competitiveness and resilience, drawing attention to burden and compliance costs created by the Corporate Sustainability Reporting Directive (CSRD) and the Corporate Sustainability Due Diligence Directive (CSDDD).
In its Communication on the Competitive Compass for the EU[18], the Commission confirmed that it would propose a first 'Simplification Omnibus package' to support simplification in the fields of sustainable finance reporting, due diligence and EU Taxonomy.

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15 Commission Delegated Regulation (EU) 2023/2486 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to the sustainable use and protection of water and marine resources, to the transition to a circular economy, to pollution prevention and control, or to the protection and restoration of biodiversity and ecosystems and for determining whether that economic activity causes no significant harm to any of the other environmental objectives and amending Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities.

16 See reply to question 159 in the Commission Notice C/2023/267 on the interpretation and implementation of certain legal provisions of the EU Taxonomy Climate Delegated Act establishing technical screening criteria for economic activities that contribute substantially to climate change mitigation or climate change adaptation and do no significant harm to other environmental objective.

17 The future of European competitiveness Part A; A competitiveness strategy for Europe, available at: https://commission.europa.eu/document/download/97e481fd-2dc3-412d-be4c-f152a8232961_en (last accessed: November 2025).

18 Communication from the Commission to the European Parliament, the European council, the Council, the European Economic and Social Committee and the Committee of the Regions, COM (2025) 30 final: A Competitiveness Compass for the EU. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0030 (last accessed: November 2025).

On 26 February 2025, the Commission adopted a package of proposals[19] to simplify EU rules, boost competitiveness, and unlock additional investment capacity. In particular, the proposal for a Directive amending the Audit Directive, Accounting Directive, Corporate Sustainability Reporting Directive, and the Corporate Sustainability Due Diligence Directive - Omnibus I - COM(2025)81[20] has defined actions to:

- Make sustainability reporting more accessible and efficient. For example, the obligation to prepare and publish a sustainability statement at individual level should be reduced to large undertakings with an average of more than 1000 employees during the financial year.
- Simplify due diligence to support responsible business practices. For example, to reduce burden on companies that have to comply with that obligation, the required due diligence should, as a general rule, be limited to the company's own operations, those of its subsidiaries and those of its direct business partners ('tier 1').

1.2.4 Recast of the Energy Efficiency Directive

On 10 October 2023, the recast of the Energy Efficiency Directive (EED recast)[21] entered into force. The EED recast significantly raises the EU's ambition for energy efficiency, promotes 'energy efficiency first' as an overall principle of EU energy policy and introduces measures to promote energy efficiency in the ICT sector.
In particular, the Directive asks (Article 12 and Annex VII) that in order to promote sustainable development in the ICT sector, particularly of data centres, Member States should ensure the collection and publication data on the energy performance and water footprint of data centres. In addition, Article 12 was complemented by a Delegated Act adopted in March 2024 (Commission Delegated Regulation 2024/1364 of 14 March 2024 on the first phase of the establishment of a common Union rating scheme for data centres)[22].
The Article 12 of the EED recast focuses on data centres and it may apply to telecommunications networks as such networks progress towards increased virtualisation and some of the telecommunication functions (e.g. signal processing) may be implemented on data computing platforms decoupled from telecommunication physical hardware systems. In addition, energy efficiency efforts in data centres could result in the optimisation of the production, processing and transmission of data, thus driving efficiencies in telecommunications networks as well.

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19 Commission simplifies rules on sustainability and EU investments, available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_25_614 (last accessed: November 2025).

20 Proposal for a Directive amending the Audit Directive, Accounting Directive, Corporate Sustainability Reporting Directive, and the Corporate Sustainability Due Diligence Directive - Omnibus I - COM(2025)81, available at: https://finance.ec.europa.eu/document/download/161070f0-aca7-4b44-b20a-52bd879575bc_en?filename=proposal-directive-amending-accounting-audit-csrd-csddd-directives_en.pdf (last accessed: November 2025).

21 Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast), http://data.europa.eu/eli/dir/2023/1791/oj (last accessed: November 2025).

22 Commission Delegated Regulation (EU) 2024/1364 of 14 March 2024 on the first phase of the establishment of a common Union rating scheme for data centres, http://data.europa.eu/eli/reg_del/2024/1364/oj (last accessed: November 2025).

Reporting requirements about data centres should be in line with (and not duplicate) requirements set out in Commission Delegated Regulation (EU) 2024/1364 on the first phase of the establishment of a common Union rating scheme for data centres. Data centres are therefore not in scope of this EU CoC (see Section 1.4).

1.2.5 Ecodesign Framework

Directive 2009/125/EC, known as Ecodesign Directive[23], establishes a framework for the setting of ecodesign requirements for energy-related products. Regulation (EU) 2019/424[24] applies the ecodesign to servers and data storage products, including network servers, and sets the ecodesign requirements including the power consumption requirements for the different states (i.e., idle, active). Regulation (EU) 2019/1782 implementing the ecodesign directive for External Power Supplies sets out requirements both for no-load power consumption and active efficiency[25]. In addition, the ecodesign regulation on off mode, standby mode, and networked standby ((EC) No 1275/2008, to be repealed by (EU) 2023/826) (EC 2023) sets out requirements for home and office electric and electronic equipment. This includes high network-availability (HiNA) equipment, such as routers, switches wireless network access points, etc., and equipment with HiNA functionalities[26].
The Ecodesign Directive has been recently amended with the Ecodesign for Sustainable Products Regulation (ESPR) 2024/1781 (EU 2024) establishing a framework for the setting of ecodesign requirements for sustainable products, amending Directive (EU) 2020/1828[27] and Regulation (EU) 2023/1542[28] and repealing Directive 2009/125/EC. Whereas the EU Ecodesign Framework focuses on equipment, this EU CoC adopts an aggregate perspective of the network (see Section 1.4).

1.2.6 Environmental Footprint (EF)

In addition to the above, the Environmental Footprint (EF) method developed by the EC in EC Recommendation 2021/2279 (EC 2021) represents a robust method for accounting GHG emissions. The EF has been built involving Life Cycle Assessment (LCA) practitioners and hundreds of companies in different sectors (see in particular slide 21 of (EC ENV 2025)). In this sense, the EF method provides a general methodological framework for the calculation of the carbon and environmental footprint. The EF method also reflects advancements in line with progress of the LCA scientific community (including the latest updates from the (IPCC 2021) on characterisation factors for Global Warming Potential) and takes into consideration international standards and initiatives (such as the UN Life

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23 Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products.

24 Commission Regulation (EU) 2019/424 of 15 March 2019 laying down eco-design requirements for servers and data storage products pursuant to Directive 2009/125/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 617/2013.

25 https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/energy-efficient-products/external-power-supplies_en (last accessed: November 2025).

26 https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/energy-efficient-products/mode-standby-and-networked-standby-devices_en (last accessed: November 2025).

27 Directive (EU) 2020/1828 of the European Parliament and of the Council of 25 November 2020 on representative actions for the protection of the collective interests of consumers and repealing Directive 2009/22/EC, https://eur-lex.europa.eu/eli/dir/2020/1828/oj (last accessed: November 2025).

28 Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC, https://eur-lex.europa.eu/eli/reg/2023/1542/oj (last accessed: November 2025).

Cycle Initiative). The role of the EF method has been recognised also in several EU policies, such as regarding requirements on the carbon footprint of batteries (as in the Battery Regulation[29]), manufacturing of low carbon technologies (as for criteria for the EU Taxonomy), the Ecodesign for Sustainable Product Regulation, and the Critical Raw Materials Act[30]. Finally, the EF method provides also the framework to develop sectorial guidance documents (so-called Product Environmental Footprint Category Rules), which currently do not exist at EU level for telecommunications networks but could be developed in the future. However, since the EF method is still under development, it cannot be applied in this version of the EU CoC.

1.3 Methodology and structure of this document

This EU Code of Conduct is based on two main elements:

- A set of best practices consisting of expected and optional practices. Expected practices are the ones, which need to be fulfilled for compliance to this CoC. Optional practices are mentioned to point to the added value of certain practices, while also recognising challenges in the implementation and therefore the need for a higher degree of their maturity, filling existing standardisation gaps. This EU CoC focuses on practices that define requirements for data collection, which could be useful for National Regulatory Authorities (NRAs) in case of any tasks relating to environmental sustainability.
- An assessment framework to be used by auditors to perform the audit and verification process, which could be used in the context of the EU Taxonomy.

Both elements are supported by a specific set of standards, which are used to define the format and content of the data collection as well as the reporting processes.

The reliance on standards fulfils the following two objectives:

- Uniformity of the collected data and reporting to the extent possible. For this scope, each practice in the framework for data collection and reporting is covered by an adequate standard. Potential alternative standards are listed with a justification of the reason why they were discarded.
- Mitigation or removal of any ambiguities in the definition of the format and content of the reports to be provided for an audit.

In order to fulfil these objectives, the following criteria are applied to select the standards for the practices of this EU CoC:

- Availability: A standard is freely and publicly available.
- Redundancy: A standard is covered by a technically equivalent standard.
- Measurability: A standard includes a concrete methodology and metrics, which can be audited.

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29 Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC, https://eur-lex.europa.eu/eli/reg/2023/1542/oj (last accessed: November 2025).

30 Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, https://eur-lex.europa.eu/eli/reg/2024/1252/oj (last accessed: November 2025).

— Telco focus: A standard is (at least partially) specific to telecommunications networks.

— Network focus: A standard provides data points from a live network at aggregate level, rather than from solely a specific equipment, component, site and/or from laboratory conditions.

The approach followed in this EU CoC builds upon concepts defined in the following reference documents:

— the JRC's Assessment Framework for Data Centres (EC JRC 2023a) in the Context of Activity 8.1 in the Taxonomy Climate Delegated Act,

— the concept of Life Cycle Assessments (LCAs) (EC JRC 2019a) and

— the Environmental Footprint methods (as Organisation Environmental Footprint or OEF and the Product Environmental Footprint)[31].

This document is organised in the following sections (beyond this section 1):

- Section 2 outlines the elements of the assessment framework, which is relevant in particular for auditors in the context of the EU Taxonomy.
- Section 3 identifies and describes the best practices and standards for the three indicator types (energy, climate, environment).
- Section 4 summarises the expected practices identified in the previous section, excluding the optional ones, to further support the reporting and auditing process in an EU Taxonomy context.
- Section 5 presents conclusions.

The annex provides a description of the standards analysed in this EU CoC.

1.4 Scope

The scope of this EU CoC is to define best practices for collecting data on the environmental sustainability of telecommunications networks for the identified indicators with a view to achieving transparency of the sector as regards its progress towards the EU's climate targets. This should create the necessary conditions for the sector to be potentially included in the EU Taxonomy.

Since the identified standards often cover several indicators at the same time, the definitions of the best practices were grouped into energy-, climate-, and environment-related practices as follows:

1. Energy Consumption (energy)
2. Energy Efficiency (energy)
3. GHG Scope 1, Scope 2, Scope 3 (climate)
4. Renewable Energy (climate)
5. E-waste (environment)
6. Distribution or utilisation of recycled/ refurbished/ reused products. (environment)

[31] Commission Recommendation (EU) 2021/2279 of 15 December 2021 on the use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations. https://eur-lex.europa.eu/eli/reco/2021/2279/oj (last accessed: November 2025).

This EU CoC applies to electronic communications networks in the sense of Art. 2(1) Directive (EU) 2018/1972 (the European Electronic Communications Code). The specific boundaries of the network infrastructure have already been described in Section 2 of (EC JRC 2023b) and can be summarised as follows:

- Access, metro, and backbone networks, including ground segments of satellite communications networks (e.g., gateway hubs, network management and telemetry functions), and Fixed Wireless Access (FWA), which may be supplied by fibre or any other (or mixed) backhaul. Reporting organisations should consider only the best practices of the categories of network (or network segments) that they manage.
- Terrestrial mobile and fixed networks. The latter explicitly include fibre (FTTH/FTTB; PON and point-to-point), copper-based ((V)DSL) and cable/HFC (DOCSIS – in EC JRC 2023b best represented by FTTC). Reporting organisations should consider only the best practices of the network segments they manage.
- At an aggregate level, all telecommunications equipment required for operating the network elements (e.g., the physical, transport and network functionalities, i.e., generation, transmission, transport, switching and reception of digital and analog signals) as well as network management functions. Telecommunications equipment can be both specific devices tailored to support the specific telecommunications functions (such as base stations, routers) as well as general-purpose hardware (e.g., servers) to support network functions implemented in software (e.g., virtual RAN functions). For fibre access networks, the access segment terminates at the ONU/ONT, which is located at customer premises but not considered as customer premises equipment (as controlled by the network operator).

The following elements are out of scope:

- Telecommunications equipment installed at the user premises and user devices that are outside the control of the network operator.
- Data centres or server farms.
- Satellite communications networks, except for the ground segment (see above). Out of scope are therefore the space segment, which includes the satellites in space, and the user segment, which includes the satellite terminals. The space segment is out of scope, as its main environmental footprint (e.g., related to the launch of satellites) is not specific to the telecommunications network[32]. The user segment is excluded, as it is equivalent to user equipment like mobile devices.
- Sustainability aspects of telecommunications services, since the focus is on service-agnostic network infrastructure.

[32] Note that sustainability aspects of the space segment (e.g., assessment and reduction of the environmental impact of the space activities) are included in the EU Space Act, see https://defence-industry-space.ec.europa.eu/eu-space-act_en Last accessed: November 2025.

— Aspects of biodiversity, water-use, pollution, land-use, working conditions, communities' economic, social and cultural rights, social inclusion of consumers and business conduct, as covered by the broader and horizontal European Sustainability Reporting Standards (ESRS) (EC 2023a), since these are less or not relevant for the environmental sustainability of telecommunications networks (EC JRC 2023b).

The following delineations apply to account for the interdependencies and relationships with other CoCs, as identified in Section 3 of (EC JRC 2023b):

— This EU CoC is self-contained and it is not dependent on other CoCs for reasons of clarity and completeness, even if practices can be inspired by other CoCs for ICT[33] (e.g., on data centres and on broadband equipment). Moreover, as the other CoCs may evolve independently from this EU CoC, the logical integrity of this EU CoC should be preserved.

— In particular, this EU CoC does not overlap with the CoC on Data Centres (EC JRC 2021a). It is to be noted that data centres will be regulated by the framework established by the Energy Efficiency Directive (see Section 1.2.4).

— This EU CoC differs from the CoC on Broadband Communication Equipment (EC JRC 2021), since it addresses the network and its segments at an aggregate level from a standardisation perspective, while not providing recommendations per equipment component. This notwithstanding, broadband equipment relevant for network functionality may feature in both CoCs (e.g., cellular base stations).

Regarding the different phases of the network infrastructure lifecycle, i.e. design, manufacturing, deployment, operation, maintenance, audit and decommissioning (e.g., putting the equipment out of service), this EU CoC is especially focused on the operation phase, where standards are most mature, while however also identifying potentially relevant practices for the other phases (e.g., for circular economy aspects like e-waste). As standards for these practices mature, the currently optional practices may become expected under future iterations of this EU CoC.

Acknowledging the difficulties of comparing network infrastructures with each other, which would require accounting for factors such as geographical topology, population density, and network license requirements, this EU CoC is focused on measuring improvements of any network infrastructure over time, providing a common methodology across the EU.

[33] Code of Conduct for ICT. https://e3p.jrc.ec.europa.eu/en/groups/ict-code-conduct. Last accessed November 2025.

2 Assessment Framework

The implementation of this EU CoC is composed of the list of best practices (expected and optional ones) described in the following Section 3 and a set of processes defined to evaluate the compliance of the reporting organisation to this EU CoC. The set of processes is defined as the assessment framework, which includes the audit dimension, in order to facilitate the assessment of conformity with the identified best practices. This section describes the main elements of the assessment framework.

2.1 Applying the assessment framework in an EU Taxonomy context

This section builds on Section 2 of the JRC technical report JRC131733 (EC JRC 2023a), which elaborates on the policy and regulatory context related to the sustainability of telecommunications networks.

This assessment framework would serve the purpose of verification of compliance with the substantial contribution criteria for climate change mitigation. All expected practices that should be included under the substantial contribution criteria are included in Section 4 of this document.
The burden of proof for Taxonomy-alignment lies with the economic operators who are required to disclose or wish to voluntarily showcase their share of Taxonomy-aligned activities.

In accordance with the screening criterion, the best practices would be addressed in the form of "Compliant", "Non-applicable (with justification)" or "Equivalent alternative", or "Non-compliant", with the relevant supporting evidence.

2.2 Requirements for audit firms

This section builds on Section 3 of the JRC technical report JRC131733 (EC JRC 2023a).

The auditing standards for audit firms are the following:

- ISO/IEC 17000 - Conformity assessment — Vocabulary and general principles

General terms and definitions relating to conformity assessment, including the accreditation of conformity assessment bodies, and to the use of conformity assessment to facilitate trade.

- ISO/IEC 17021 – Conformity assessment — Requirements for bodies providing audit and certification of management systems

Principles and requirements for the competence, consistency and impartiality of bodies providing audit and certification of all types of management systems

- ISO/IEC 17029 - Conformity Assessment — General principles and requirements for validation and verification bodies

General principles and requirements for the competence, consistent operation and impartiality of bodies performing validation/verification as conformity assessment activities. Bodies operating according to ISO/IEC 17029 can provide Validation/Verification as a First-party, Second-party or Third-party activity.

- ISO/IEC 19011 - Guidelines for auditing management systems

Guidance on auditing management systems, including the principles of auditing, managing an audit programme and conducting management system audits, as well as guidance on the evaluation of competence of individuals involved in the audit process.

3 Best practices and standards for environmentally sustainable telecommunications networks

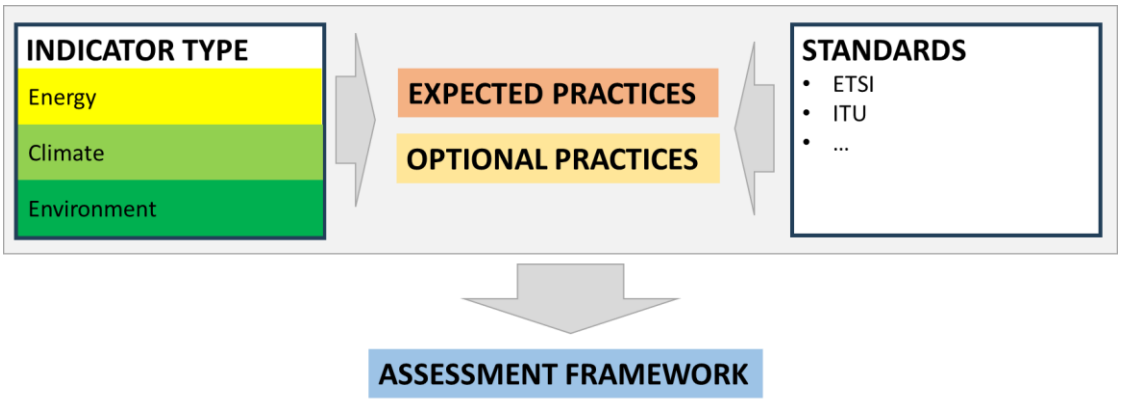
Commitment: Reporting organisations strive for assessing progress towards the EU's climate targets through implementing the expected practices laid out in this EU CoC. Additional optional practices provide indications on how reporting organisations could further measure reductions in their environmental footprint. As the standardisation landscape evolves, optional practices may become expected practices in future iterations of this EU CoC. Reporting organisations complying with this EU CoC commit to implementing the relevant tracking mechanisms during 2026, making public first data points gathered under this EU CoC on a best-effort basis and sharing lessons learned by Q2 2027. This will allow making public the first full-year data points for fiscal year 2027 in 2028, in line with the publication requirements for fiscal year reporting laid down in the sustainable finance framework, once revised[34].
In order to provide flexibility and acknowledge potential implementation challenges, particularly in the initial phase until Q2 2027, reporting organisations are expected to apply the practices in this EU CoC on a best-effort basis, relying on internal methodologies for measurements, estimations, and evaluations based on the best available information.

Reporting organisations should always use the most recent version of any of the standards suggested in this EU CoC (i.e., a mere update of a standard after the publication date of this EU CoC does not require a revision of this EU CoC). The application of the EU CoC should not be constrained by third-party criteria. For example, in case of diverging interpretations between a reporting organisation and an external auditor regarding the data to be gathered under this EU CoC, the reporting organisation's interpretation should prevail. Standardisation bodies should update the respective standards to ensure a consistent interpretation. The Commission, consulting with stakeholders, will regularly review and, if it deems necessary, update this EU CoC to address issues of diverging interpretations and to reflect the evolving standardisation landscape in current and future practices.

This section identifies and lays down best practices based on standards to be used to measure, estimate or evaluate the environmental sustainability of various indicators in the different segments of the network. The overall interplay between the assessment framework, the indicators, best practices and standards is shown in Figure 1. For each indicator type (energy, climate, environment), a set of best practices (expected and/or optional) is defined. To implement the best practices, a set of standards is identified.

[34] Commission simplifies rules on sustainability and EU investments, available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_25_614 (last accessed: November 2025).

Figure 1. Illustrative interplay between assessment framework, indicator types, best practices and standards



Source: JRC analysis

Some best practices and standards are at a level of the entire network infrastructure (i.e., Networks General), while others are specific to a network segment (e.g., Radio Access Network).

For each indicator type and network segment (if available), a table with the list of best practices is provided, including if a practice is expected or optional under this EU CoC and which standards should be used. While (EC JRC 2023b) already provided a range of potentially relevant standards, the sections below also list potential alternative standards, including explanations why they were discarded. The choice of selecting or discarding a standard is determined by the goals and scope of this EU CoC and does not imply any judgement of a standard's general usefulness. As the standardisation landscape evolves, sustainability may become a default feature in future technologies (e.g., standards evolution in 3GPP towards sustainability aspects like energy efficiency, which may continue in the future with 6G from Release 20 onwards)[35].

For each best practice, the reporting organisations are required to provide evidence documenting their compliance with the listed standard(s) in the implementation of the best practice. In case of conflicts between the scope of any of the suggested standards and the scope of this EU CoC, the scope of this EU CoC prevails.

Note: For editorial reasons, only the identifier of the standard is provided in the tables. The full names of all the standards are provided in the Annex.

A template of a best practice is shown in Table 2.

Table 2. Template table of best practices with the related descriptions.

No.	Name	Framework	Evidence	Expected/Optional

[35] SUSTAIN-6G project. https://sustain-6g.eu/ (last accessed: November 2025).

Numeric identifier of the best practice	Short description of the best practice	Framework for the implementation of the best practice, including the standard or set of complementary standards to be used.	Evidence to be used by the reporting organisation to implement the best practice.	Indication if the reporting organisation is expected to implement a best practice to comply with this EU CoC or if a practice is optional (i.e. when not implemented, it would not result in non-compliance with this EU CoC).

Source: JRC analysis

For some of the best practices, and to provide flexibility to address potential implementation challenges, particularly in the initial phase until Q2 2027, reporting organisations have the possibility to choose to report data using the following methods:

- Measure: In this case, reporting organisations measure a specific metric (e.g., energy consumption) directly at the telecommunications network (segment).
- Estimate: In this case, reporting organisations can estimate a specific metric on the basis of published data, validated data or data owned by the reporting organisation. These estimations should be carried out using the best internal information available. This approach ensures flexibility and recognises that estimations may be necessary where data gaps or lack of granularity exist. It is recommended that reporting organisations make public which part of the data is based on estimations and the methodology behind them (next to the results).
- Evaluate: This case is a combination of measurement and estimation. For example, reporting organisations can measure the metric on one or a set of selected sites and then extrapolate the data to the entire telecommunications network. These evaluations should be carried out using the best internal information available. This approach ensures flexibility and recognises that evaluations may be necessary where data gaps or lack of granularity exists. It is recommended that reporting organisations make public which part of the data is based on estimations as compared to measurements and the methodology behind these evaluations (next to the results).

3.1 Best practices and standards related to energy indicators

This section defines the best practices and standards related to energy indicators for various network segments.

3.1.1 Overview

Energy consumption is the integral of power over a specific time (e.g., one hour) and can be measured in Watt Hour (Wh).
Standardisation bodies (e.g., ETSI) also define different power and energy efficiency Key Performance Indicators (KPI) and measurement conditions (e.g., static test condition or dynamic traffic loads).

The main metrics of the evaluation identified in (EC JRC 2023b) for this indicator are Wh and their multiples: kWh, MWh, or GWh. These metrics are also supported by the majority of the stakeholders, who provided input to the survey described in (EC JRC 2023b) and by BEREC in (BEREC 2023) and (Ademe, Arcep 2022).

Energy efficiency evaluates how effective the consumed energy is for performing a task (i.e., carrying data traffic in the network).

The main metrics of evaluation identified in (EC JRC 2023b) are consumed energy (kWh, MWh or GWh) and consumed energy per unit of transmitted data traffic (e.g., per GigaByte or kWh/GByte).

The main metrics for this indicator are the consumed energy (Wh with potential prefixes) per units of transmitted data traffic (i.e. bits with potential prefixes). However, it should be noted that the metric related to energy consumption per transmitted data volume is not appropriate for long-term assessment of the evolution of the energy efficiency of the network. This metric should only be used to assess an individual change in the network, for example an equipment upgrade or introduction of energy saving software features, where the indicator can be used to measure any improvements implemented. It should also be noted that there are other factors determining the performance of the network that are not included in this EU CoC, such as user experience and capacity.

An overview of the identified set of standards is provided in Table 3. Details on the standards and their use are provided in subsequent sections. The selection is underpinned by recent research by (Öko-Institut for BNetzA 2025).

Table 3. Set of standards identified for the energy indicators.

Network segment (below):	Standard (most recent version to be used)
Networks General	ETSI EN 303 471 (optional)
Radio Access Network	ETSI ES 203 228 (expected)[36]

[36] ETSI ES 203 228 includes contribution on energy efficiency of NFV and sites (i.e. equipment facilities) in Radio Access Networks. At the time of writing, the standard is under revision to specify new energy efficiency KPIs for network slices, integrate energy consumption metrics for network functions composed of virtual network functions, and evolutions such as containerised virtual network functions or cloud computing for core network energy consumption.

Fixed Access Network	ETSI EN 305 200-2-2 (specified through ETSI TS 105 200-2-2) and ETSI EN 305 200-4-4 for cable/HFC elements (expected)[37]
Equipment facilities	ETSI EN 305 200-3-1, specified through ETSI TS 105 200-3-1 (optional)

Source: JRC analysis

3.1.2 Networks General

This section is used to identify and describe practices, which are general to all segments in the network infrastructure.

No.	Name	Framework	Evidence	Expected/Optional
3.1.2.1	Assessment of the energy consumption and efficiency of the Network Function Virtualisation (NFV)	The reporting organisation should measure, estimate or evaluate the energy consumption and efficiency of the NFV using ETSI EN 303 471.	Documented information in accordance with the listed standard.	Optional

Other potentially relevant standards, not included in the practices above, are shown in the following table, including reasons why they were discarded.

Name	Reasons for exclusion
ETSI ES 203 539 Environmental Engineering (EE); Measurement method for energy efficiency of Network Functions Virtualisation (NFV) in laboratory environment	Network focus: Laboratory conditions and therefore inferior to ETSI EN 303 471, which addresses live operational environments.
ETSI GS OEU 012	Telco focus: Rather than focusing on a telecommunications network, this ETSI Group Specification (GS) defines Global Key Performance Indicators for energy management in ICT sites including, but not limited to operator data centres (ODC), operator sites (OS) and customer data centres (CDC). Moreover, ETSI GS are developed by ETSI Industry Specification Groups (ISGs) and represent the views of the ISG members, not necessarily the entire ETSI membership. Therefore, a GS is not endorsed by the full ETSI body in the same way that ETSI European Norms (EN), Standards (ES) and Technical Specifications (TS) are.
ISO/IEC 13273-1. Energy efficiency and renewable energy sources — Common international terminology Part 1: Energy efficiency.	Availability: Not freely available.

[37] This set of standards may be (partially) replaced by ETSI ES 204 086 on fixed network energy efficiency definition and measurement, which is under development at the time of writing.

ISO 14001. Environmental management systems — Requirements with guidance for use.	Availability, measurability: Not freely available. Provides only general concepts. No prescribed indicators that must be recorded, so no standardised measurements.
ISO 50001 Energy management	Availability, telco focus: Not freely available and not telco-specific (horizontal standard).
ITU-T L.1325 Green ICT solutions for telecom network facilities	Measurability: The standard focuses more on high-level benchmarking than specific measurements for audit purposes (as opposed to the suggested standards in this EU CoC).
ITU-T L.1382 Smart energy solution for telecommunication rooms	Network focus: The standard includes site-level analysis, which is not the focus of this EU CoC.
ITU-T Y. 3022 Measuring energy in networks	Network focus: Includes equipment-level analysis (even of non-network equipment), which is not the focus of this EU CoC.

3.1.3 Radio Access Network

This section is used to identify and describe practices, which are specific to the RAN.

No.	Name	Framework	Evidence	Expected/Optional
3.1.3.1	Assessment of the energy consumption and efficiency of the radio access network (RAN)	The reporting organisation shall measure, estimate or evaluate the energy consumption and efficiency of the RAN using ETSI ES 203 228.	Documented information in accordance with the listed standard(s).	Expected
3.1.3.2	Supply chain specifications in procurement	The reporting organisation should use the energy consumption and efficiency of the network as a high priority decision factor in a tender/procurement process. The reporting organisation should rely on the data obtained using ETSI ES 203 228.	Documented information describing the supply chain procurement generally used by the reporting organisation in one year of activity in accordance with the listed standard(s).	Optional

Other potentially relevant standards, not included in the practices above, are shown in the following table, including reasons why they were discarded.

Name	Reasons for exclusion
ETSI EN 303 472 Energy Efficiency measurement methodology and metrics for RAN equipment	Network focus, redundancy: This standard does not cover 5G and focuses on measurement at site level, rather than gathering network-wide energy data points that can be converted into carbon emissions.

	Furthermore, measurements at site level are included in ETSI ES 203 228.
ETSI EN 305 200-2-3 Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Operational infrastructures; Global KPIs; Part 2: Specific requirements; Sub-part 3: Mobile broadband access networks	Measurability: This standard does not include the latest technologies and the latest metrics for energy consumption/efficiency of radio base stations It also does not consider quality of service.
ETSI ES 201 554. Environmental Engineering (EE); Measurement method for Energy efficiency of Mobile Core network and Radio Access Control equipment.	Network focus, redundancy: This standard is used to measure the power efficiency of specific mobile network equipment, so not adequate for network-wide measurements (as opposed to the suggested RAN standards above). Furthermore, its contribution is included in ETSI ES 203 228.
ETSI TR 103 540. Environmental Engineering (EE); Mobile Network (MN) Energy Consumption (EC) estimation method; Energy estimation method based on statistical approach.	Measurability: Technical report for estimations based on statistical approach, which can be replaced by other methods identified by the stakeholder. This leaves too much flexibility, which may limit auditability.
ITU-T L.1310. Energy efficiency metrics and measurement methods for telecommunication equipment.	Network focus: A good part of the standard is focused on testing equipment, which decreases its applicability for telecoms networks.
ITU-T L.1330. Energy efficiency measurement and metrics for telecommunication networks.	Redundancy: Matched to ETSI ES 203 228.
ITU-T L.1331. Assessment of mobile network energy efficiency.	Redundancy: Matched with ETSI ES 203 228.
ITU-T L.1333. Carbon data intensity for network energy performance monitoring.	Redundancy: Matched with ETSI ES 203 228.
ITU-T L.1350. Energy efficiency metrics of a base station site.	Measurability, network focus: This standard defines a taxonomy of the equipment in an electronic communications network, which is used for LCA. However, it leaves too much flexibility, allowing for taxonomies to be defined outside the standard.
ITU-T L. 1351 Energy efficiency measurement methodology for base station sites.	Measurability, network focus: Based on L.1350, therefore same reasoning. Focus on base station site measurements.
ITU-T L.1390. Energy saving technologies and best practices for 5G radio access network (RAN) equipment.	Network focus: The focus is on equipment specific to 5G RAN, rather than gathering network-wide data points across different technologies.

3.1.4 Fixed Access Networks

This section is used to identify and describe practices, which are specific to the FAN.

No.	Name	Framework	Evidence	Expected/Optional

3.1.4.1	Assessment of the energy consumption and efficiency of the fixed access network (FAN)	The reporting organisation shall measure, estimate or evaluate the energy consumption and efficiency[38] of the FAN using ETSI EN 305 200-2-2 (specified through ETSI TS 105 200-2-2) and ETSI EN 305 200-4-4 for cable/HFC elements.[39]	Documented information in accordance with the listed standard(s).	Expected
3.1.4.2	Supply chain specifications in procurement	The reporting organisation should use the energy consumption and efficiency of the network as a high priority decision factor in a tender/procurement process. The reporting organisation should rely on the data obtained using ETSI EN 305 200-2-2, specified through ETSI TS 105 200-2-2.	Documented information describing the supply chain procurement generally used by the reporting organisation in one year of activity in accordance with the listed standard(s).	Optional

Other potentially relevant standards, not included in the practices above, are shown in the following table, including reasons why they were discarded.

Name	Reasons for exclusion
ETSI EN 303 215 Measurement methods and limits for power consumption in broadband telecommunication networks equipment	Network focus: Focus is site/equipment level, rather than gathering network-wide energy data points that can be converted into carbon emissions.
ETSI ES 204 086. Environmental Engineering (EE); Fixed Network Energy Efficiency definition and measurement	Availability: This standard will define the network-level energy efficiency of end-to-end of fixed networks, which includes energy efficiency rating (EER) definition and assessment method. This standard may be useful in the future but is not yet completed at the time of drafting this EU CoC.
ETSI TR 102 530. Environmental Engineering (EE); The reduction of energy consumption in telecommunications equipment and related infrastructure.	Measurability, network focus: Technical report providing an overview on methods for the reduction of energy consumption in telecommunications equipment and related infrastructure (inferior compared to the standards identified in the best practices).

[38] The energy efficiency is the inverse of the task effectiveness defined in the indicated standard.

[39] This set of standards may be (partially) replaced by ETSI ES 204 086 on fixed network energy efficiency definition and measurement, which is under development at the time of writing.

3.1.5 Equipment facilities

This section is used to identify and describe practices, which are specific to equipment facilities.

No.	Name	Framework	Evidence	Expected/Optional
3.1.5.1	Assessment of the energy consumption and efficiency of equipment facilities	The reporting organisation should measure, estimate or evaluate the energy consumption and efficiency of the equipment facilities using ETSI EN 305-200-3-1 and ETSI TS 105 200-3-1.	Documented information in accordance with the listed standard(s).	Optional

Other potentially relevant standards, not included in the practices above, are shown in the following table, including reasons why they were discarded.

Name	Reasons for exclusion
CENELEC EN 50600 is a European standard that provides comprehensive specifications for the planning, construction, and operation of data centres. It covers various aspects, including building construction, power distribution, environmental control, telecommunications infrastructure, and security systems.	Telco focus: The standard is specific for buildings for data centres and not specific to telecommunications networks. In addition, it may create overlaps with the CoC on data centres.
CEN EN 15978 is a European Standard that provides a calculation method for assessing the environmental performance of buildings throughout their entire life cycle. It utilizes Life Cycle Assessment (LCA) principles to evaluate the environmental impact of a building from construction to end-of-life.	Telco focus: This standard is for buildings in general and not specific to telecommunications networks.
ITU-T L.1370 Sustainable and intelligent building services.	Telco focus: This standard is for buildings in general and not specific to telecommunications networks.
ITU-T L.1371 A methodology for assessing and scoring the sustainability performance of office buildings.	Telco focus: This standard is for buildings in general and not specific to telecommunications networks.

3.2 Best practices and standards related to climate indicators

3.2.1 Overview

This section provides the best practices for climate-related indicators.

Greenhouse Gas (GHG) emissions are measured in CO_2 equivalents (CO_2e). According to the GHG-protocol, three scopes are defined to operationalise the accounting of GHG-relevant activities from the perspective of reporting[40]. However, the three scopes are generic and not specific to

[40] Other notable industry initiatives include the Science-Based Targets initiative (SBTi), the Global enabling Sustainability Initiative (GeSI), and the Global Reporting Initiative (GRI).

telecommunications networks. This EU CoC therefore focuses on calculating CO_2e emissions related to a network's energy consumption, while reflecting a reporting organisation's energy mix across different energy sources (including renewables, nuclear, different types of combustion fuels).

This approach corresponds to a focus on scope 2 emissions under the GHG protocol, i.e. emissions from the generation of electricity, heat or steam that has been purchased by the reporting organisation, e.g., indirect emissions from electricity use or energy bought for network operations produced on a company's behalf. Scope 2 emissions should be calculated according to the location-based and market-based methodologies, which are properly representative of the emissions effectively emitted to produce the energy consumed by companies.

Both scope 1 emissions, i.e. direct emissions from sources that a company owns or controls (such as burning fuel in company-owned vehicles or machinery), and scope 3 emissions[41], i.e. indirect emissions that occur in a company's value chain (such as extraction and production of purchased materials, transportation of goods, disposal), could be reflected in a network related life cycle assessment. However, this currently constitutes an optional practice under this EU CoC due to its related administrative burden on reporting organisations.

The tonnes of CO_2e were indicated as the main metric by the stakeholders (EC JRC 2023b), which will therefore also be used here.
The proposed set of standards are the same as for energy above, using the formulas in ETSI ES 205 200-3-2 to convert the data into CO_2e. They need to be linked to a reporting organisation's energy mix, which should be publicly available and reflect different energy sources (incl. renewables, nuclear, different types of combustion fuels). Reporting organisations shall use the most recent emission factors provided by the GHG Protocol.[42]

An overview of the identified set of standards is provided in Table 4. Details on the standards and their use are provided in subsequent sections.

Table 4. Set of standards identified for the climate change indicators.

Network segment (below):	Standard (most recent version to be used)
Networks General	ETSI ES 205 200-3-2[43], based on ETSI EN 303 471 (optional) CPPA Standard Documentation (optional) ETSI ES 203 199[44] (optional)
Radio Access Network	ETSI ES 205 200-3-2[45], based on ETSI ES 203 228 (expected)

41 ITU-T Supplement 57 of ITU-T L.1420 provides an example of guidance for telecommunications operators in this context.

42 Available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

43 Clause 4 of ETSI ES 205 200-3-2 provides the formula for the CO_2e calculation, but the emission factors provided by the GHG Protocol shall be used for this calculation, which are available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

44 This may be simplified by ETSI ES 204 085 on simplified LCA for ICT, which is under development at the time of writing.

45 Clause 4 of ETSI ES 205 200-3-2 provides the formula for the CO_2e calculation, but the emission factors provided by the GHG Protocol shall be used for this calculation, which are available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

Fixed Access Network	ETSI ES 205 200-3-2[46], based on ETSI EN 305 200-2-2 (specified through ETSI TS 105 200-2-2) and ETSI EN 305 200-4-4 for cable/HFC elements (expected)[47]
Equipment facilities	ETSI ES 205 200-3-2[48], based on ETSI EN 305 200-3-1 (specified through ETSI TS 105 200-3-1) (optional)

Source: JRC analysis

3.2.2 Networks General

No.	Name	Framework	Evidence	Expected
3.2.2.1	Assessment of GHG scope 2 emissions of the NFV	The reporting organisation should measure, estimate or evaluate the GHG scope 2 impact of the NFV by converting energy data obtained under ETSI EN 303 471 into CO_2e, using ETSI ES 205 200-3-2[49].	Documented information in accordance with the listed standard(s).	Optional
3.2.2.2	Definition of Commercial Power Purchase Agreements (CPPA)	The reporting organisation should establish CPPA through well-defined standards and practices, such as the CPPA Standard Documentation defined by the European Federation of Energy Traders (EFET)[50].	Documented information in accordance with the CPPA Standard Documentation. The location information should be added to the CPPA Standard documentation.	Optional
3.2.2.3	Life Cycle Assessment (LCA) of the network	The reporting organisation should introduce a study for Life Cycle Assessment (LCA) in accordance with the networks-related sections of ETSI ES 203 199[51].	Documented information in accordance with the listed standard(s).	Optional

[46] Clause 4 of ETSI ES 205 200-3-2 provides the formula for the CO_2e calculation, but the emission factors provided by the GHG Protocol shall be used for this calculation, which are available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

[47] This set of standards may be (partially) replaced by ETSI ES 204 086 on fixed network energy efficiency definition and measurement, which is under development at the time of writing.

[48] Clause 4 of ETSI ES 205 200-3-2 provides the formula for the CO_2e calculation, but the emission factors provided by the GHG Protocol shall be used for this calculation, which are available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

[49] Clause 4 of ETSI ES 205 200-3-2 provides the formula for the CO_2e calculation, but the emission factors provided by the GHG Protocol shall be used for this calculation, which are available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

[50] Energy Traders Europe. https://www.energytraderseurope.org/.

[51] This may be simplified by ETSI ES 204 085 on simplified LCA for ICT, which is under development at the time of writing.

Other potentially relevant standards, not included in the practices above, are shown in the following table, including reasons why they were discarded.

Name	Reasons for exclusion
ETSI TR 103 540. Environmental Engineering (EE); Mobile Network (MN) Energy Consumption (EC) estimation method; Energy estimation method based on statistical approach	Measurability: Technical report for estimations based on statistical approach, which can be replaced by other methods identified by the stakeholder. This leaves too much flexibility, which may limit auditability.
ISO 14044 Environmental management — Life cycle assessment — Requirements and guidelines.	Redundancy, availability: ETSI ES 203 199 covers a similar area and is freely available.
ISO 14064 – 2 Greenhouse gases Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements	Availability, telco focus: Not freely available and not specific to telecommunications networks.
ITU-T L.1410 Methodology for environmental life cycle assessments of information and communication technology goods, networks and services	Redundancy: This standard is matched to ETSI ES 203 199.
ITU-T L.1420 ITU-T L.1430 ITU-T L.1450 ITU-T L.1470	Telco focus: While the 1400 series is drafted in ITU for GHG emissions, it is not specific to telecommunications networks.

3.2.3 Radio Access Network

This section is used to identify and describe practices, which are specific to the RAN.

No.	Name	Framework	Evidence	Expected/Optional
3.2.3.1	Assessment of GHG scope 2 emissions of the radio access network (RAN)	The reporting organisation shall measure, estimate or evaluate the GHG scope 2 impact of the RAN by converting energy data obtained under ETSI ES 203 228 into CO_2e, using ETSI ES 205 200-3-2[52].	Documented information in accordance with the listed standard(s).	Expected

[52] Clause 4 of ETSI ES 205 200-3-2 provides the formula for the CO_2e calculation, but the emission factors provided by the GHG Protocol shall be used for this calculation, which are available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

3.2.4 Fixed Access Networks

This section is used to identify and describe practices, which are specific to the FAN.

No.	Name	Framework	Evidence	Expected/Optional
3.2.4.1	Assessment of GHG scope 2 emissions of the fixed access network (FAN)	The reporting organisation shall measure, estimate or evaluate the GHG scope 2 impact of the FAN by converting energy data obtained under ETSI EN 305 200-2-2 (specified through ETSI TS 105 200-2-2) and ETSI EN 305 200-4-4 for cable/HFC elements[53] into CO_2e, using ETSI ES 205 200-3-2[54].	Documented information in accordance with the listed standard(s).	Expected

3.2.5 Equipment facilities

This section is used to identify and describe practices, which are specific to equipment facilities.

No.	Name	Framework	Evidence	Expected/Optional
3.2.5.1	Assessment of GHG scope 2 emissions of equipment facilities	The reporting organisation should measure, estimate or evaluate the GHG scope 2 impact of equipment facilities by converting energy data obtained under ETSI EN 305-200-3-1 (specified through ETSI TS 105 200-3-1) into CO_2e, using ETSI ES 205 200-3-2[55].	Documented information in accordance with the listed standard(s).	Optional

[53] This set of standards may be (partially) replaced by ETSI ES 204 086 on fixed network energy efficiency definition and measurement, which is under development at the time of writing.

[54] Clause 4 of ETSI ES 205 200-3-2 provides the formula for the CO_2e calculation, but the emission factors provided by the GHG Protocol shall be used for this calculation, which are available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

[55] Clause 4 of ETSI ES 205 200-3-2 provides the formula for the CO_2e calculation, but the emission factors provided by the GHG Protocol shall be used for this calculation, which are available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

3.3 Best practices and standards related to environment indicators

3.3.1 Overview

E-waste is also known as waste electrical and electronic equipment (WEEE) and refers to electrical or electronic equipment that has been discarded by its end-user.
E-waste is also sometimes referred to as eWaste, e-waste or e-Waste.

The weight of e-waste materials produced by the companies has been indicated by (BEREC 2023) as the preferred measurement metric, since it was reported as the most used indicator in the survey conducted by BEREC. It can be expressed in kg or its multiples (i.e. tonnes). (IDEA Consult and Öko-Institut 2022) also used the metric tonnes of e-waste as the main indicator together with the Electronics Disposal Efficiency (EDE) indicator, which shows the responsible (in terms of controlled e-waste) disposed weight in comparison to the overall total weight disposed. More than e-waste, a metric related to the weight of critical raw materials could also be used. The results of the survey conducted in (EC JRC 2023b) indicated the weight of e-waste materials as the main indicator with a high percentage (84%) of respondents indicating it as a very important indicator.

The recycling, refurbishment and reuse of products enable a circular economy where the waste of electronic components is minimised. In addition, the recycling, refurbishment, and reuse of telecommunications equipment reduce the problems associated with e-waste, such as the pollution generated by the disposal of electronic products (please see Section 1.1 for definitions of these terms).

As indicated in (EC JRC 2023b), regarding the measurement metrics, (BEREC 2023) indicated various metrics, which are mostly based on ratios like kg, or number of second-hand equipment items, and the number of items collected or the number of refurbished units of reused products. IDEA Consult and Öko-Institut for the European Commission DG CNECT 2022 also indicate the number of items collected or refurbished units of reused products as a potential metric.
As summarised in (EC JRC 2023b), the three main metrics identified by the stakeholders are weight of recycled, refurbished, and reused products, share of returned products and number of refurbished products.
However, there are also specific contexts, which should be considered. For example, a significant amount of old PSTN, Cable-TV, xDSL, and 2G/3G network equipment will be retired in the coming years, without the possibility to reuse or refurbish it.

The proposed set of standards for these types of environment indicators are ETSI EN 305 174-8, specified through ETSI TS 105 174-8, which were the most concrete, auditable, and telecommunications-specific among the standards analysed. They also explicitly link to the WEEE[56] and RoHS Substances Directives[57] and complement the family of standards identified in the sections above. However, the practice established remains currently optional under this EU CoC due to the standards' limited market penetration and therefore unknown administrative burden on reporting organisations (Öko-Institut for BNetzA 2025).

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[56] Waste from Electrical and Electronic Equipment (WEEE). https://environment.ec.europa.eu/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en (last accessed: November 2025).

[57] Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS), https://environment.ec.europa.eu/topics/waste-and-recycling/rohs-directive_en (last accessed: November 2025).

An overview of the identified set of standards is provided in Table 5. Details on the standards and their use are provided in subsequent sections.

Table 5. Set of standards identified for the environment indicators.

Network segment (below):	Standard (most recent version to be used)
Networks General	ETSI EN 305 174-8, specified through ETSI TS 105 174-8 (optional).

Source: JRC analysis

3.3.2 Networks General

Both e-waste and distribution or utilisation of recycled/ refurbished/ reused products are indicators that impact all the components of the network infrastructure in a similar way.
Therefore, the best practice identified applies only to Networks General.

No.	Name	Framework	Evidence	Expected/Optional
3.3.2.1	Assessment of e-waste and recycled/ refurbished/ reused products	The reporting organisation should measure, estimate or evaluate network-related e-waste and recycled/ refurbished/ reused products using ETSI EN 305 174-8, specified through ETSI TS 105 174-8.	Documented information in accordance with the listed standard(s).	Optional

Other potentially relevant standards, not included in the practices above, are shown in the following table, including reasons why they were discarded.

Name	Reasons for exclusion
ETSI TR 103 476 Environmental Engineering (EE); Circular Economy (CE) in Information and Communication Technology (ICT); Definition of approaches, concepts and metrics	Measurability: The ETSI Technical Report provides an overview of current approaches, concepts and metrics of CE and RE and their applicability for the ICT infrastructure goods. As such, it does not aim to be an auditable standard (as opposed to the suggested standards above).
ITU-T L.1022. Circular economy: Definitions and concepts for material efficiency for information and communication technology.	Measurability: Provides a general non-prescriptive framework, rather than auditable requirements, and is therefore inferior to the suggested standard above in the best practice definition.
ITU-T L.1023 Assessment method for circularity performance scoring	Measurability: Focus is a score, so less relevant than the suggested standards above.
ITU-T L.1050 Methodology to identify key equipment for environmental impact and e-waste generation assessment of network architectures	Measurability: Focus is prioritisation of equipment rather than auditable requirements (as opposed to the suggested standards above in the best practice definition).

4 Summary of the assessment framework

The aim of this section is to summarise the expected practices identified in the previous sections, excluding the optional ones, to support the reporting and auditing process in an EU Taxonomy context. This section and the related table take inspiration from (EC JRC 2023a). The list of expected practices is provided in Table 6.

Table 6: List of expected practices.

No.	Indicator type: Network segment	Name	Framework	Evidence
3.1.3.1	Energy: RAN	Assessment of the energy consumption and efficiency of the radio access network (RAN)	The reporting organisation shall measure, estimate or evaluate the energy consumption and efficiency of the RAN using ETSI ES 203 228.	Documented information in accordance with the listed standard(s).
3.1.4.1	Energy: FAN	Assessment of the energy consumption and efficiency of the fixed access network (FAN)	The reporting organisation shall measure, estimate or evaluate the energy consumption and efficiency[58] of the FAN using ETSI EN 305 200-2-2 (specified through ETSI TS 105 200-2-2) and ETSI EN 305 200-4-4 for cable/HFC elements[59].	Documented information in accordance with the listed standard(s).
3.2.3.1	Climate: RAN	Assessment of GHG scope 2 emissions of the radio access network (RAN)	The reporting organisation shall measure, estimate or evaluate the GHG scope 2 impact of the RAN by converting energy data obtained under ETSI ES 203 228 into CO_2e, using ETSI ES 205 200-3-2[60].	Documented information in accordance with the listed standard(s).
3.2.4.1	Climate: FAN	Assessment of GHG scope 2 emissions of the fixed access network (FAN)	The reporting organisation shall measure, estimate or evaluate the GHG scope 2 impact of the FAN by converting energy data obtained under ETSI EN 305 200-2-2 (specified through ETSI TS 105 200-2-2) and ETSI EN 305 200-4-4 for cable/HFC elements[61] into CO_2e, using ETSI ES 205 200-3-2[62].	Documented information in accordance with the listed standard(s).

Source: JRC analysis

[58] The energy efficiency is the inverse of the task effectiveness defined in the indicated standard.

[59] This set of standards may be (partially) replaced by ETSI ES 204 086 on fixed network energy efficiency definition and measurement, which is under development at the time of writing.

[60] Clause 4 of ETSI ES 205 200-3-2 provides the formula for the CO_2e calculation, but the emission factors provided by the GHG Protocol shall be used for this calculation, which are available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

[61] This set of standards may be (partially) replaced by ETSI ES 204 086 on fixed network energy efficiency definition and measurement, which is under development at the time of writing.

[62] Clause 4 of ETSI ES 205 200-3-2 provides the formula for the CO_2e calculation, but the emission factors provided by the GHG Protocol shall be used for this calculation, which are available at Calculation Tools and Guidance | GHG Protocol (last accessed: November 2025).

5 Conclusion

This EU Code of Conduct has identified and laid down best practices based on standards, which can be adopted by stakeholders involved in the design, manufacturing, deployment, operation, maintenance, audit and decommissioning of telecommunications networks even if the main focus of this CoC is operation. It includes an assessment framework that could be considered under the EU Taxonomy for substantial contribution criteria. Stakeholders complying with this EU CoC shall demonstrate their compliance in their environmental sustainability reporting.

Reporting organisations' experience of gathering data to comply with this EU CoC may also point to potential gaps in standardisation, which should be addressed by future standardisation activities.

The Commission, consulting with stakeholders, will regularly review and, if it deems necessary, update this EU CoC to address issues of diverging interpretations and to reflect the evolving standardisation landscape in current and future practices.

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List of abbreviations

BS	Base Station
CDC	Customer Data Centres
CER	Corporate Environment Responsibility
CO2e	CO2 equivalent
CoC	Code of Conduct
CPPA	Corporate Power Purchase Agreement
CSRD	Corporate Sustainability Reporting Directive
DOCSIS	Data Over Cable Service Interface Specification
DSL	Digital Subscriber Line
ECN	Electronic Communications Networks
ECS	Electronic Communications Services
EDE	Electronics Disposal Efficiency
EE	Environmental Engineering
EED	Energy Efficiency Directive
EEE	Electronic and Electric Equipment
EF	Environmental Footprint
EN	European Norm
ERF	Energy Reuse Factor
ES	ETSI Standard
ESRS	European Sustainability Reporting Standards
FAN	Fixed Access Network
FTTB	Fiber to the Building
FTTH	Fiber to the Home
GHG	Green House Gas
GRI	Global Reporting Initiative
HFC	Hybrid fibre coaxial
HiNA	High Network-Availability
ICT	Information and Communications Technology
ISG	Industry Specification Groups
ITU	International Telecommunication Union
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
MN	Mobile Network
NFV	Network Function Virtualisation
NTP	Network termination point
ODC	Operator Data Centres
OEF	Organisation Environmental Footprint
OLT	Optical Line Terminal
ONT	Optical Network Terminal
ONU	Optical Network Unit
OS	Operator sites
PEF	Product Environmental Footprint
PON	Passive Optical Network
PSTN	Public Switched Transport Network
PUE	Power Usage Effectiveness
RAN	Radio Access Network
RNC	Radio Access Controller
RoHS	Restriction of Hazardous Substances
TR	Technical Report
TS	Technical Specification
VDSL	Very-high-bit-rate digital subscriber line

VNF Virtual Network Function
WEEE Waste from Electrical and Electronic Equipment

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Annex
List of standards analysed in this EU Code of Conduct

Identifier in this document	Name of the standard	Description of the standard
CEN EN 15978:2011	CEN EN 15978:2011	Sustainability of construction works - Assessment of environmental performance of buildings - Calculation methods
CENELEC EN 50600		The EN 50600 is a European standard that provides specifications for the planning, construction and operation of a data centre
ETSI EN 303 215	ETSI EN 303 215 V1.3.1 (2015-04)	Environmental Engineering (EE); Measurement methods and limits for power consumption in broadband telecommunication networks equipment The standard defines the power consumption metrics, the methodology and the test conditions to measure the power consumption of broadband fixed telecommunication networks equipment. The standard does not cover all possible configuration of equipment but only homogenous configurations. The types of broadband access technologies covered by the present document are the ones widely deployed at the date of publication. Currently, the standard considers DSLAM DSL, MSAN, GPON OLT and Point to Point OLT equipment. Other access technologies may be included in further versions of the standard. The present document also considers measurement methodology for VDSL2 equipment with vectoring functionality. In addition to the full power state, power-saving states as defined in DSL standards and are also covered.
ETSI EN 303 471	ETSI EN 303 471 V1.1.1 (2019-01	ETSI EN 303 471 V1.1.1 (2019-01) Environmental Engineering (EE); Energy Efficiency measurement methodology and metrics for Network Function Virtualisation (NFV)
ETSI EN 303 472	ETSI EN 303 472 (2018-06)	Environmental Engineering (EE); Energy Efficiency measurement methodology and metrics for RAN equipment.
ETSI EN 305 174-8	ETSI EN 305 174-8 V1.1.1 (2018-01)	Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Lifecycle Resource Management; Part 8: Management of end of life of ICT equipment (ICT waste/end of life)
ETSI EN 305 200-1	ETSI EN 305 200-1 (2018-04)	Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Operational infrastructures; Global KPIs; Part 1: General requirements
ETSI EN 305 200-2-2	ETSI EN 305 200-2-2 V1.2.1 (2018-08)	Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Operational infrastructures; Global KPIs; Part 2: Specific requirements; Sub-part 2: Fixed broadband access networks
ETSI EN 305 200-2-3	ETSI EN 305 200-2-3 V1.1.1 (2018-06)	Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Operational infrastructures; Global KPIs; Part 2: Specific requirements; Sub-part 3: Mobile broadband access networks
ETSI EN 305 200-3-1	ETSI EN 305 200-3-1 V1.1.1 (2018-02)	Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Operational infrastructures; Global KPIs; Part 3: ICT Sites; Sub-part 1: DCEM
ETSI ES 201 554	ETSI ES 201 554 V1.2.1 (2014-07)	Environmental Engineering (EE); Measurement method for Energy efficiency of Mobile Core network and Radio Access Control equipment.

		The standard defines metrics and measurement methods applicable for the following systems and nodes: Mobile core functions (GGSN, HLR, MGW, MME, MSC, SGSN and PGW/SGW), Radio Access Controller (RNC), Base Station Controller (BSC) and IMS core functions (BGCF, CSCF, HSS, IBCF, MRFC, MRFP, SLF and LRF).
ETSI ES 202 706-1	ETSI ES 202 706-1 V1.8.0 (2024-07)	Environmental Engineering (EE); Metrics and measurement method for energy efficiency of wireless access network equipment; Part 1: Power consumption - static measurement method. This standard defines the measurement method for the evaluation of base station power consumption and energy consumption with static load: 1) Average power consumption of BS equipment under static test conditions: the BS average power consumption is based on measured BS power consumption data under static condition when the BS is loaded artificially in a lab for three different loads, low, medium and busy hour under given reference configuration. 2) Daily average energy consumption.
ETSI ES 203 199	ETSI ES 203 199 V1.4.0 (2024-07)	Environmental Engineering (EE); Methodology for environmental Life Cycle Assessment (LCA) of Information and Communication Technology (ICT) goods, networks and services The standard defines a set of requirements to reflect the quality that LCA practitioners should strive for. At this stage some of the requirements put forward in the standard are considered as challenging due to Life Cycle Assessment (LCA) tool limitations, a lack of data, limitations in data granularity, etc. It is thus recognized that compliance to all requirements in the standard may not be possible at the time the present document is published. However, to foster results of LCAs becoming more transparent and, for the quality of data and LCA tools to improve over time, the standard defines the requirements outlined in the following pages. The standard requires that deviation(s) from the requirements are clearly motivated and reported.
ETSI ES 203 228	ETSI ES 203 228 V1.4.1 (2022-04)	Environmental Engineering (EE); Assessment of mobile network energy efficiency. The standard deals with the definition of metrics and methods to measure energy performance of Mobile Radio Access Networks and adopts an approach based on the measurement of such performance on small networks, for feasibility and simplicity purposes. Such simplified approach is proposed for approximate energy efficiency evaluations and cannot be considered as a reference for planning evaluation purposes throughout the network operation process
ETSI ES 203 539	ETSI ES 203 539 V1.1.1 (2019-06)	Environmental Engineering (EE); Measurement method for energy efficiency of Network Functions Virtualisation (NFV) in laboratory environment
ETSI ES 205 200-2-2	ETSI ES 205 200-2-2 V1.1.1 (2018-05)	Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures; Part 2: Specific requirements; Sub-part 2: Fixed broadband access networks
ETSI ES 205 200-1	ETSI ES 205 200-1 V1.2.1 (2014)	ETSI ES 205 200-1 V1.2.1 (2014-03) Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures; Part 1: General requirements
ETSI ES 205 200-3-2	ETSI ES 205 200-3-2	Access, Terminals, Transmission and Multiplexing (ATTM); Carbon Intensity Management; Operational infrastructures;

	V1.1.1 (2022-04)	Implementation of Global KPIs; Part 3: ICT Sites; Sub-part 2: DCCM
ETSI GS OEU 012	ETSI GS OEU 012 V1.1.1 (2015-10)	Operational energy Efficiency for Users (OEU); Technical Global KPIs for Fixed Access Networks
ETSI TR 102 530	ETSI TR 102 530 V1.2.1 (2011-07)	Environmental Engineering (EE); The reduction of energy consumption in telecommunications equipment and related infrastructure The present document covers various methods of increasing the energy efficiency of telecom systems by controlling/reducing the energy consumption in the telecommunication network equipment and related infrastructure.
ETSI TR 102 643	ETSI TR 102 643 V1.0.2 (2010-01)	Human Factors (HF); Quality of Experience (QoE) requirements for real-time communication services
ETSI TR 103 476	ETSI TR 103 476 V1.1.2 (2018-02)	Environmental Engineering (EE); Circular Economy (CE) in Information and Communication Technology (ICT); Definition of approaches, concepts and metrics
ETSI TR 103 540	ETSI TR 103 540 V1.1.1 (2018-04)	Environmental Engineering (EE); Mobile Network (MN) Energy Consumption (EC) estimation method; Energy estimation method based on statistical approach. The standard is aimed to define an estimation method for anticipating the total energy consumption of a radio access network based on measuring energy consumption of a few randomly chosen sites. The standard is used when measuring energy consumption of the whole network is either impossible or costly to an operator. Two different methods have been presented in the standard, one based on Basic Estimation Method and another based on stratified Estimation Method.
ETSI TR 103 541	ETSI TR 103 541 V1.1.1 (2018-05)	Environmental Engineering (EE); Best practice to assess energy performance of future Radio Access Network (RAN) deployment The aim of the standard is to collect best practices on future RAN energy performance assessment, list KPI's from available standards and define additional KPI's needed for a relevant assessment of future RAN deployment. As RAN consumes 80% of mobile systems energy consumption, the standard is focusing on RAN site and equipment, including Backhaul.
ETSI TR 103 937	ETSI TR 103 937 V1.1.1 (2024-08)	Cyber Security (CYBER); Cyber Resiliency and Supply Chain Management
ETSI TS 105 174-8	ETSI TS 105 174-8 V1.2.1 (2019-12)	Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Lifecycle Resource Management; Part 8: Implementation of WEEE practices for ICT equipment during maintenance and at end-of-life
ETSI TS 105 200-2-2	ETSI TS 105 200-2-2 V1.3.1 (2019-12)	Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Operational infrastructures; Implementation of Global KPIs; Part 2: Specific requirements; Sub-part 2: Fixed broadband access networks
ETSI TS 105 200-2-3	ETSI TS 105 200-2-3 V1.2.1 (2019-12)	Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Operational infrastructures; Implementation of Global KPIs; Part 2: Specific requirements; Sub-part 3: Mobile broadband access networks
ETSI TS 105 200-3-1	ETSI TS 105 200-3-1 V1.2.1 (2019-12)	Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Operational infrastructures; Implementation of Global KPIs; Part 3: ICT Sites; Sub-part 1: DCEM
GHG Protocol	GHG Protocol Scope 1 and 2	GHG Protocol Corporate Standard provides standards and guidance for companies and other types of organisations

		preparing a GHG emissions inventory. It covers the accounting and reporting of the six greenhouse gases covered by the Kyoto Protocol — carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF6). https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf
GHG Protocol Value Chain	GHG Protocol Value Chain for Scope 3 assessment	The Corporate Value Chain (Scope 3) Accounting and Reporting Standard allows companies to assess their entire value chain emissions impact and identify where to focus reduction activities.
ISO 14001	ISO 14001:2015 Environmental management systems — Requirements with guidance for use	ISO 14001 is the internationally recognized standard for environmental management systems (EMS). It provides a framework for organizations to design and implement an EMS, and continually improve their environmental performance. By adhering to this standard, organizations can ensure they are taking proactive measures to minimize their environmental footprint, comply with relevant legal requirements, and achieve their environmental objectives. The framework encompasses various aspects, from resource usage and waste management to monitoring environmental performance and involving stakeholders in environmental commitments.
ISO 14044	ISO 14044:2006	ISO 14044:2006 specifies requirements and provides guidelines for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, relationship between the LCA phases, and conditions for use of value choices and optional elements. ISO 14044:2006 covers life cycle assessment (LCA) studies and life cycle inventory (LCI) studies.
ISO 14064	ISO 14064-1:2018	This document specifies principles and requirements at the organization level for the quantification and reporting of greenhouse gas (GHG) emissions and removals. It includes requirements for the design, development, management, reporting and verification of an organization's GHG inventory. The ISO 14064 series is GHG programme neutral. If a GHG programme is applicable, requirements of that GHG programme are additional to the requirements of the ISO 14064 series.
ISO 17000	ISO/IEC 17000:2020	This document specifies general terms and definitions relating to conformity assessment (including the accreditation of conformity assessment bodies) and to the use of conformity assessment to facilitate trade.
ISO 50001	ISO 50001 Energy management	ISO 50001 is based on the management system model of continual improvement also used for other well-known standards such as ISO 9001 or ISO 14001. This makes it easier for organisations to integrate energy management into their overall efforts to improve quality and environmental management. ISO 50001 provides a framework of requirements for organisations to: - Develop a policy for more efficient use of energy - Fix targets and objectives to meet the policy

		- Use data to better understand and make decisions about energy use - Measure the results - Review how well the policy works, and Continually improve energy management.
ISO/IEC 13273-1	ISO/IEC 13273-1. Energy efficiency and renewable energy sources — Common international terminology Part 1: Energy efficiency.	ISO/IEC 13273-1:2015 contains transverse concepts and their definitions in the subject fields of energy efficiency. This horizontal standard is primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 108.
ISO 14064 – 2	ISO 14064-2:2019	This standard specifies principles and requirements and provides guidance at the project level for the quantification, monitoring and reporting of activities intended to cause greenhouse gas (GHG) emission reductions or removal enhancements. It includes requirements for planning a GHG project, identifying and selecting GHG sources, sinks and reservoirs (SSRs) relevant to the project and baseline scenario, monitoring, quantifying, documenting and reporting GHG project performance and managing data quality.
ISO/IEC 17021	ISO/IEC 17021-1:2015	Conformity assessment — Requirements for bodies providing audit and certification of management systems
ISO/IEC 17029	ISO/IEC 17029:2019	ISO/IEC 17029:2019 specifies the general principles and requirements for the competence, consistent operation, and impartiality of bodies performing validation and verification as conformity assessment activities. It covers both validation and verification activities, regardless of whether they are conducted by first-party, second-party, or third-party bodies.
ISO/IEC 19011	ISO 19011:2018	Guidelines for auditing management systems
ISO/IEC 30134-2	ISO/IEC 30134-2:2016	ISO/IEC 30134-2:2016 a) defines the power usage effectiveness (PUE) of a data centre, b) introduces PUE measurement categories, c) describes the relationship of this KPI to a data centre's infrastructure, information technology equipment and information technology operations, d) defines the measurement, the calculation and the reporting of the parameter, e) provides information on the correct interpretation of the PUE.
ISO/IEC 30134-6	ISO/IEC 30134-6:2021 Information technology — Data centres key performance indicators — Part 6: Energy	The standard specifies the energy reuse factor (ERF) as a KPI to quantify the reuse of the energy consumed in a data centre. ERF is defined as the ratio of energy being reused divided by the sum of all energy consumed in a data centre. The ERF does reflect the efficiency of the reuse process; the reuse process is not part of a data centre.

	Reuse Factor (ERF)	
ITU-T L Suppl. 57	ITU-T L Suppl. 57 (06/2023)	ITU-T L Suppl. 57 ITU-T L.1420 - Scope 3 guidance for telecommunication operators.
ITU-T L.1050	ITU-T L.1050 (January 2022)	The objective of this Recommendation is to provide best practices for equipment identification for ICT service architecture designers to be able to evaluate the environmental performance of different network architectures. The Recommendation will specify the necessary requirements for identifying equipment types used in network life cycle assessments (LCAs). The proposed set of equipment can be used to evaluate the following dimensions of network architecture: - Energy efficiency - E-waste amounts - LCA impacts - Circularity indicators [ITU-T L.1023]
ITU-T L.1022	L.1022 (10/19)	Circular economy: Definitions and concepts for material efficiency for information and communication technology
ITU-T L.1023	L.1023 (08/23)	Assessment method for circularity performance scoring
ITU-T L.1031	ITU-T L.1031 (06/24)	Guideline for the development of an e-waste management system and achieving the e-waste targets of the Connect 2030 Agenda
ITU-T L.1050	L.1050 (01/22)	Methodology to identify key equipment for environmental impact and e- waste generation assessment of network architectures
ITU-T L.1310	ITU-T L.1310 (09-20)	Energy efficiency metrics and measurement methods for telecommunication equipment
ITU-T L.1320	ITU-T L.1320 (03/14)	Energy efficiency metrics and measurement for power and cooling equipment for telecommunications and data centres
ITU-T L.1325	ITU-T L.1325 (12/16)	Green ICT solutions for telecom network facilities
ITU-T L.1330	ITU-T L.1330 (03/15)	Energy efficiency measurement and metrics for telecommunication networks
ITU-T L.1331	L.1331 (01/22)	Assessment of mobile network energy efficiency
ITU-T L.1333	L.1333 (09/22)	L.1333 : Carbon data intensity for network energy performance monitoring
ITU-T L1350	ITU-T L.1350 (10/16)	Energy efficiency metrics of a base station site
ITU-T L1351	ITU-T L.1351 (08/18)	Energy efficiency measurement methodology for base station sites
ITU-T L.1370	ITU-T L.1370 (11/18)	Sustainable and intelligent building services
ITU-T L.1371	L.1371 (06/20)	A methodology for assessing and scoring the sustainability performance of office buildings
ITU-T L.1382	L.1382 (06/20)	Smart energy solution for telecommunication rooms
ITU-T L.1390	L.1390 (08/22)	Energy saving technologies and best practices for 5G radio access network (RAN) equipment
ITU-T L-1410	L.1410 (11/24)	Methodology for environmental life cycle assessments of information and communication technology goods, networks and service

ITU-T L.1420	L.1420 (02/12)	Methodology for energy consumption and greenhouse gas emissions impact assessment of information and communication technologies in organisations
ITU-T L.1430	L.1430 (12/13)	Methodology for assessment of the environmental impact of information and communication technology greenhouse gas and energy projects
ITU-T L.1440	L.1440 (10/15)	Methodology for environmental impact assessment of information and communication technologies at city level
ITU-T L.1450	L.1450 (09/18)	Methodologies for the assessment of the environmental impact of the information and communication technology sector
ITU-T L.1470	L.1470 (01/20)	Greenhouse gas emissions trajectories for the information and communication technology sector compatible with the UNFCCC Paris Agreement
ITU-Y-3022	ITU-T Y.3022 (08/14)	This Recommendation describes a reference model and methods for measuring energy in networks to reduce the operating expenditure (OPEX) of telecommunication network equipment. This Recommendation covers the following: • requirements to measure energy consumption in networks; • reference model and architecture to build an energy measurement framework; • energy efficiency metrics of network elements based on a reference model; • energy consumption measurement methods based on functional architecture.
RE 100	RE100 Technical Criteria	https://www.there100.org/sites/re100/files/2020-10/RE100%20Technical%20Criteria.pdf

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