

Enforcement, empowerment or engagement?

How leading regulators are encouraging
sustainability in the ICT sector

May 2025

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Executive summary

Information and Communications Technology (ICT) is booming like never before. That may be good for consumers and industry – but it could be a problem for the environment.

Data centres, devices and network infrastructure are proliferating – and so are the greenhouse gas emissions they bring. Awareness of this issue is also growing. Customers want the brands they support to be more responsible. Governments want to be seen to be acting.

How can the companies involved reduce their adverse impacts on the environment? Which national and international authorities and organisations are trying to drive this process? And how? Answering these and related questions is the aim of this study.

So where do we start? In this case, by selecting a group of countries and organisations that we believe are leaders in ICT but also committed to sustainability. Their approaches have guided our analysis by suggesting real or potential best practices.

This study therefore highlights five countries and their ICT national regulatory authorities (NRAs). However, the role of ICT NRAs is not the same across all five countries. As we have discovered, some ICT NRAs drive green initiatives and policies. Some leave this to other government departments – or collaborate with these departments. Some incorporate elements of both approaches.

International organisations also play a key role in directing sustainability efforts in the ICT sector. This can help ICT NRAs and even offer opportunities for learning and collaboration. With this in mind, we discuss the work of regional and global regulatory groups as well as the ICT NRAs.

We begin our study by looking at three specific approaches used by ICT NRAs to encourage sustainability initiatives: regulatory instruments, information sharing and awareness, and collaborative and practical initiatives.

But these approaches incorporate other, more targeted initiatives, some involving laws or mandates, some largely voluntary or incentive based. Regulatory instruments, for instance, include regulations, tax incentives and reporting requirements. We attempt to define all three and to what extent these initiatives are implemented by the various countries and institutions studied here. Case studies also show how these work in the real world.

Similarly, the overarching term 'information sharing and awareness' covers the publication of standards, reports, analyses, studies and guidelines, as well as consumer and supplier awareness-raising initiatives and the use of certifications and labels. All are discussed in more detail, along with case studies.

The third approach, collaborative and practical initiatives, also incorporates more specific measures. They include collaboration and engagement initiatives such as industry engagement and public consultations, and practical capacity-building measures such as training and financing. Here again, our study of which ICT NRAs use them and how is supported by case studies, as is a brief round-up of other initiatives not covered earlier.

In all cases, not just initiatives by ICT NRAs but also those by international organisations are discussed. We also highlight government-level initiatives which are not managed by ICT NRAs or indeed aimed directly at ICT companies but whose provisions could affect the ICT sector.

But this isn't just about governments or international organisations. Consumers, corporate customers and many ICT companies want to see some action. As we have discovered, consumers and corporate customers in particular are clamouring for information that can help them make informed choices, and some ICT companies – including some big-name mobile operators – have already set ambitious targets for things like carbon neutrality.

The conclusion of this study looks back on all of these findings and asks a few more important questions. What should be done? And by whom? Should rules and standards be laid down or are non-mandatory approaches like awareness raising, guidelines, training and industry engagement the way forward for NRAs? Are things fine as they are? Or could ICT NRAs play a more active role, possibly even push for more regulatory powers, and actually use them?

This study may help them to decide.

The following table provides an overview of the initiatives found by country.

	Australia 	Canada 	France 	Singapore 	UK 	EU 	Int. bodies 
Regulatory instruments							
Regulations	✓	•	✓	✓	•	✓	✗
Tax incentives	•	✓	✓	•	•	•	✗
Reporting requirements	✓	•	✓	•	•	✓	✓
Information sharing and awareness							
Published standards	✓	✓	✓	✓	✓	✓	✓
Published research	✓	✓	✓	•	✓	✓	✓
Published guidelines	✓	•	✓	✓	✓	✓	✓
Consumer awareness	✓	✓	✓	✓	✓	✓	✓
Certifications and labels	✓	✓	✓	✓	✓	✓	✓
Collaborative and practical initiatives							
Industry engagement	✓	✓	✓	✓	✓	✓	✓
Public consultations	✓	•	✓	•	✓	✓	✓
Training	✓	✓	•	•	✓	✓	✓
Financing and grants	✓	✓	•	✓	•	✓	✓
Green ticks (out of 12)	0	0	8	6	3	11	10

Table 1: Overview of initiatives employed across benchmarked countries¹

¹ Four symbols are used to indicate the level of implementation of each initiative. A green tick means that the initiative is actively being carried out by the telecom regulator (the ICT NRA) or an international organisation. A blue tick indicates that the initiative is taking place in the country and affects that country's ICT operators, however it is not directly managed by the ICT NRA but by other governmental bodies or stakeholders. A blue dot indicates an initiative that has not been designed with the ICT sector in mind but does affect it; general sustainability measures that affect all companies would be relevant here. A red cross means no initiative is being implemented that affects ICT players.

1.

Introduction

The Information and Communications Technology (ICT) sector stands at a crossroads. Yes, digital transformation is accelerating across industries – but so are fears about the environmental impact of ICT infrastructure and operations. The ICT industry, which includes telecommunications, data centres and electronic devices, is estimated to account for between 2-4%² of global greenhouse gas (GHG) emissions across its lifecycle (Figure 1 shows the main sources of ICT-related emissions). This percentage is already comparable to the aviation industry, and it is growing.

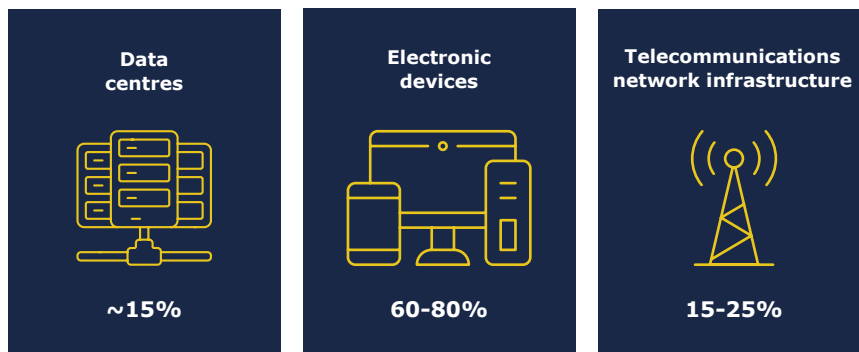


Figure 1: Main sources of ICT emissions³

But ICT companies don't have to be seen as a threat to the environment. Indeed, they can lead sustainability efforts, both by reducing their own environmental impact and by driving greener solutions across the industries that rely on ICT. International ICT organisations such as the International Telecommunication Union (ITU) and the Body of European Regulators for Electronic Communications (BEREC) understand this and are increasingly integrating sustainability into their agendas. So too are ICT national regulatory authorities (ICT NRAs). All are, to a greater or lesser degree, using regulatory tools, fostering information sharing, and engaging in collaborative initiatives with operators to drive ICT sustainability efforts.

2 https://www.berec.europa.eu/sites/default/files/files/document_register_store/2022/3/BoR%20%2822%29%2034_External%20Sustainability%20Study%20on%20Environmental%20impact%20of%20EC.pdf

3 https://www.berec.europa.eu/sites/default/files/files/document_register_store/2022/3/BoR%20%2822%29%2034_External%20Sustainability%20Study%20on%20Environmental%20impact%20of%20EC.pdf

This drive is not just about pressure from governments. Consumers are concerned about the environmental record of the brands and suppliers they engage with.⁴ Corporate customers, many of whom have set their own net zero goals, want suppliers to align with similar environmental standards.⁵ Fixed and mobile communications operators, in particular, are under pressure to meet these customer expectations.

And some are responding. Indeed, several well-known telecom operators have set ambitious targets to cut emissions and transition to renewable energy. Vodafone, for instance, has committed to achieving net zero emissions across its entire value chain by 2040.⁶ Deutsche Telekom plans to achieve climate neutrality in its operations (scope 1 and 2)⁷ by 2025 and across its value chain by 2040.⁸ Orange is targeting net-zero carbon emissions by 2040, aiming for a 30% reduction in CO2 emissions from 2015 levels by 2025.

So, telco operators and others in the ICT sector are already focusing on sustainability, driven by market pressures. We believe that ICT NRAs are in a good position to accelerate this drive and expand it. What are they doing? What more could they do? This report aims to find out. It begins, as the next section explains, by selecting some leaders in ICT regulation whose work can help us to identify the best practices of ICT NRAs on sustainability.

4 <https://hbr.org/2023/09/research-consumers-sustainability-demands-are-rising>

5 <https://btlaw.com/insights/alerts/2025/esg-and-supply-chains-in-2024-key-trends-challenges-and-future-outlook>

6 <https://assets.ctfassets.net/q70b9vms4z5k/2OdF9uYwLFlnioEyDe17bW/b9ed34da311368fb0851d2f2f1122454/vodafone-group-climate-transition-plan-2025-2027.pdf>

7 Scope 1: Direct emissions from owned or controlled sources like company vehicles and facilities.

Scope 2: Indirect emissions from purchased electricity, steam, heating and cooling consumed by the organisation.

Scope 3: All other indirect emissions that occur in a company's value chain.

8 <https://www.telekom.com/en/corporate-responsibility/environment/details/reducing-co2-355308#:~:text=By%202040%20at%20the%20latest,by%202030%20compared%20to%202020.>

9 <https://www.orange.com/en/commitments/to-the-environment/net-zero-carbon-by-2040#:~:text=We%20are%20committed%20to%20reducing,compared%20to%20our%202018%20emissions.>

2.

Best practice: the selection process

We have begun by selecting a group of ICT NRAs and international institutions that are leading names in ICT but that have also demonstrated a commitment to sustainability. We have also taken into account geographical diversity and information availability.

The country selection process is based on two respected, but different, international indices:

- **ITU's ICT Development Index 2024 (IDI)¹⁰**

This composite index provides an extensive assessment of countries' ICT development, using a range of indicators to measure internet, mobile and fixed connectivity aspects.

- **Yale's 2024 Environmental Performance Index (EPI)¹¹**

The EPI offers a data-driven overview of global sustainability, ranking 180 countries based on climate change performance, environmental health and ecosystem vitality. It uses 58 performance indicators across 11 issue categories to assess how closely countries are aligning with established environmental policy targets.

We considered only countries ranking within the top 50 of both the ITU IDI and the Yale EPI indices. The top 22 in the EPI are all European, however. We therefore decided to consider the regional top-performing countries within the environmental performance index to expand geographic diversity. Where sufficient information was not available, we moved to the second-highest regional performer in the index (ensuring the top 50 criterion for both indices was still met). The result is the country selection in Table 2. Given the dominance of European countries at the top of the EPI index, our choice among them was also based on the incentives employed by NRAs. France supplied the most information on incentives among EU countries. The UK supplied the most information on incentives among non-EU countries.

¹⁰ <https://www.itu.int/itu-d/reports/statistics/idi2024/>

¹¹ <https://epi.yale.edu/downloads/2024epireport.pdf> (rankings are available on p. XI)

	Australia 	Canada 	France 	Singapore 	UK 
ICT Development Index rank (regional rank in brackets)	16 (1)	50 (2)	44 (15)	5 (1)	23 (2)
Environmental Performance Index rank (regional rank in brackets)	23 (1)	28 (1)	12 (9)	47 (2)	5 (1)
Geographical region	Pacific	North America	Europe (EU)	Asia	Europe (non-EU)
Availability of information in English	✓	✓	✓	✓	✓

Table 2: Selected countries for analysis

The result is that the five countries in the table have a wide global spread. However, we also extended our coverage to include the EU as a relevant organisation which has a strong and influential role in deciding sustainability policy across Europe. We focused specifically on the European Commission (EC) and the Body of European Regulators for Electronic Communications (BEREC) as relevant EU divisions for the ICT sector. We also included other respected international bodies (such as the ITU) in the study, due to their status as leading global references in regulatory matters.

3.

Current state: ICT NRAs in action?

3.1. Structure of the study

So, what role do ICT NRAs have in promoting sustainability, and what measures do they use to do so? That is what this study aims to find out.

We start, in Section 3.2, by assessing the varied approaches of ICT NRAs to regulate and promote sustainability within the ICT sector.

Then we look at key areas where regulators can influence the environmental impact of the ICT sector and ask some questions, notably, what are the most popular best practices? And which measures may be easiest for ICT NRAs to implement?

Looking at how different countries perform in each category can help us to answer these questions and provide an indicator of global regulatory approaches.

We have grouped sustainability initiatives under the following categories:

- **Regulatory instruments** (Section 3.3)
This category includes formal regulatory tools and policies used by regulators to enforce sustainable practices or make use of the country's formal regulatory framework.
- **Information sharing and awareness** (Section 3.4)
This category focuses on increasing awareness and knowledge about sustainability, encompassing a range of non-mandatory measures.
- **Collaborative and practical initiatives** (Section 3.5)
This category highlights efforts to work closely with stakeholders to implement sustainability in practice.

Four symbols are used to indicate the level of implementation of each initiative:

- **Green tick**

The initiative is actively being carried out by the telecom regulator (the ICT NRA) or an international organisation.

- **Blue tick**

The initiative is taking place in the country and affects that country's ICT operators. However, it is not directly managed by the ICT NRA but by other governmental bodies or stakeholders.

- **Blue dot**

The initiative has not been designed with the ICT sector in mind but does affect it. General sustainability measures that affect all companies would be relevant here.

- **Red cross**

No initiative is being implemented that affects ICT players.

The tables within the sections that follow incorporate these symbols to show how the various initiatives are being implemented by the selected countries and organisations.

3.2.

The roles and approaches of ICT NRAs

Countries have differing approaches to regulating and promoting sustainability within the ICT sector. As Table 3 shows, in only some cases is this managed by the ICT NRA; other government departments or regulators also work in this space.

	Australia 	Canada 	France 	Singapore 	UK 
ICT NRAs own initiatives	✗	✗	✓	✓	✓
ICT NRAs collaborate with other gov. players	✗	✗	✓	✓	✓
Other gov. players are active in the ICT sustainability space	✓	✓	✓	✓	✓

Table 3: Who does what in ICT sustainability

Some ICT NRAs play a very active role in driving green initiatives and shaping sustainability policies. A notable example is French regulator Arcep (Autorité de Régulation des Communications Électroniques, des Postes et de la Distribution de la Presse), positioned as a key promoter of digital sustainability in France.

This is not the case in Australia and Canada. The ACMA (Australian Communications and Media Authority) and CRTC (Canadian Radio-television and Telecommunications Commission) focus more narrowly on market issues such as telecom licensing, spectrum management, pricing or competition issues. Sustainability-related responsibilities in these countries are overseen by other government bodies. In Canada, this involves a higher level of government than the NRA. CRTC reports to the Innovation, Science and Economic Development Canada (ISED) government department; ISED has a broad mandate and powers that include a range of sustainability measures targeting clean technology.

The UK's Ofcom (Office of Communications) is similar to Australia and Canada's ICT NRAs: sustainability issues are not within its regulatory scope. However, it recognises the importance of these issues to its sector and engages with industry about its role in encouraging sustainability.

Singapore's IMDA (Infocomm Media Development Authority), like France, is an active ICT NRA in promoting sustainability. It does not have Arcep's powers, however. Arcep, for example, can mandate a collection of sustainability data from operators. IMDA cannot.

International organisations also play a key role in directing sustainability efforts in the ICT sector. BEREC, in particular, works to align ICT NRAs' efforts across the EU by ensuring consistent application of EU regulations, fostering cooperation among national regulators, leading research on best practices, and offering further initiatives.

The EC leads efforts to embed sustainability into broader policies throughout the EU through several initiatives which directly or indirectly target the European ICT sector; the European Green Deal, for example, is a set of policy initiatives with the overarching aim of making the European Union climate neutral in 2050 which includes some green technology provisions.

The ITU, meanwhile, drives global collaboration on sustainability by developing standards that can be adopted by NRAs across the globe. It also organises a range of collaborative, practical and information-sharing initiatives.

Clearly, the role and activity level of ICT NRAs on sustainability varies across countries – but we should point out that collaboration across governments is also an option. Collaborating with other government agencies can help ICT NRAs broaden their capabilities by pooling expertise and resources, leading, perhaps, to the implementation of measures they could not devise or promote alone. ICT NRAs can also contribute their sector-specific expertise to other government agencies. And, by definition, international bodies such as the ITU, BEREC and the European Commission play a collaborative role in the international space, facilitating the exchange of best practices and aligning efforts across borders.

France's Arcep is a good example of effective collaboration with other governmental organisations. Arcep has, for example, worked closely with ADEME (the French Environment & Energy Management Agency) on a joint study to evaluate France's digital environmental footprint for 2020, 2030 and 2050. This collaboration has extended to co-running the Technical Experts Committee, which focuses on improving methodologies for measuring the environmental impact of the digital sector. Furthermore, within BEREC, Arcep has played a leading role on sustainability issues since 2020, serving as co-chair of the Sustainability Working Group and representing BEREC at EC workshops to share key insights.

The following sections look at these approaches and how they are deployed.

3.3.

Regulatory instruments: regulations, tax incentives and reporting requirements

Regulatory instruments are formal tools used by governments and regulators to guide behaviour and encourage sustainable practices. They set clear rules, provide incentives, and promote accountability.

Many governments acknowledge the need for sustainability regulatory measures in curbing emissions, reducing waste, and preserving limited resources such as energy. The countries in this study incorporate sustainability considerations into their regulations, tax systems, and reporting requirements.

In some countries, ICT is directly addressed, for example, through targeting the energy efficiency of data centres or tackling electronic waste. In others, sustainability regulatory measures are broader, for example, targeting all companies which produce a certain quantity of emissions¹² or those with large turnovers.¹³ Here, companies in the ICT sector may not be singled out, but they are affected.

In fact, regulatory measures addressing environmental concerns are everywhere. But they may be imposed by agencies with powers and mandates focused on broader environmental policy. A clear distinction emerges between NRAs, which generally have limited regulatory-making authority and technically focused mandates, and government ministries, which have greater powers and broader mandates.

We have identified three main initiatives that could come under the heading of regulatory instruments:

- **Regulations** to mandate specific practices or prohibit certain behaviours
- **Tax incentives** to financially penalise unwanted behaviours or reward desired behaviours
- **Reporting requirements** to oblige entities to disclose information related to their environmental impacts

Table 4 shows whether and to what extent these initiatives are implemented by the various countries and institutions studied here. The initiatives are discussed in more detail in the following sections.

¹² <https://www.gov.uk/government/publications/participating-in-the-uk-ets/participating-in-the-uk-ets>

¹³ <https://www.business-humanrights.org/en/big-issues/corporate-legal-accountability/frances-duty-of-vigilance-law/>

	Australia	Canada	France	Singapore	UK	EU	Int. bodies
							
Regulations	✓	•	✓	✓	•	✓	✗
Tax incentives	•	✓	✓	•	•		✗
Reporting requirements	✓	•	✓	•	•	✓	✓

Table 4: Regulatory instruments

Regulations

Regulatory frameworks increasingly lead global efforts to embed sustainability into business practices. In the ICT sector, regulatory trends focus on high-impact areas, reducing the environmental footprint of digital technologies. Common themes include waste reduction, increasing energy efficiency in data centres, and implementing eco-design directives for energy-related products.

Nevertheless, as Table 4 shows, ICT regulators are often not directly responsible for environmental regulation in their respective countries, which is often managed by other government bodies. Indeed, they usually have limited regulatory powers. France is an obvious exception. Here, the ICT NRA has played an active role in developing regulations alongside the higher levels of government (see case studies).

Regulation case study: EU

The EU has proactively included environmental considerations in its regulations. Initiatives with an ICT focus include the *Waste from Electrical and Electronic Equipment (WEEE) Directive*, which promotes the proper collection, recycling and disposal of electronic waste, and broader measures such as 2024's *Ecodesign for Sustainable Products Regulation (ESPR)* that aims to improve the circularity, energy performance, recyclability and durability of certain products.

Regulation case study: France

In France, the ICT NRA, Arcep, has not issued binding sustainability regulations but plays an active role in regulatory efforts. It has contributed to the *REEN Act* (Reduction of the Environmental Footprint of Digital Technology), which targets devices (limiting their replacement by promoting repair), promotes energy-efficient data centres and encourages eco-design. Additionally, as a member of BEREC, Arcep actively supports EU-wide regulatory initiatives, receiving regulatory direction from and contributing to the direction of BEREC's regulations.

Tax incentives

Governments use tax incentives to promote sustainability in all five countries studied here. Yet only two offer tax incentives specifically tailored to the ICT sector. Most tax incentives have a much broader focus: on energy, for example. Common initiatives here include carbon taxes imposed on heavy emitters to encourage them to use renewables. These are often balanced by positive incentives such as tax breaks, credits and exemptions for businesses investing in energy-efficient technologies and carbon-reduction solutions.

All the countries in this report have implemented tax incentives, though not via the ICT NRAs, which tend not to have the authority to do so. Higher regulatory powers are usually needed to implement the full range of digital sustainability initiatives studied here, even in France (see case study).

Tax incentive case study: France

In France, Arcep does not directly implement tax initiatives related to sustainability. However, the French government does. France offers a reduced energy tax for data centres that meet energy efficiency criteria, in the form of a Tax Exemption for Electricity Consumption, where 'digital data storage centres' are singled out to receive exemptions. As heavy energy users, data centres can receive significant benefits from such incentives.



Reporting requirements

Sustainability reporting requirements force the disclosure of information related to the environmental, social and governance (ESG) impact of business operations. These reporting requirements typically cover a range of metrics, including energy consumption and greenhouse gas (GHG) emissions.

We've seen that obligatory measures may exist at the national level but not under the ICT NRA's authority. This often extends to sustainability reporting requirements. In most countries, measures are not implemented by the ICT NRA and are much more sweeping, affecting all companies above a certain size, as in Singapore (see case study).

The ITU and World Bank recently urged ICT NRAs worldwide to seek a mandate for collecting environmental data.¹⁴ Reliable data is essential for crafting effective sustainability strategies. Yet ICT NRAs' mandates are not up to date with climate concerns. For example, only 20% of ICT NRAs currently have a mandate to collect emissions data and only 30% have any plans for future emissions monitoring. Many NRAs already collect data from the telecom industry on market indicators, however. New regulatory powers may therefore not be needed to expand data collection to include basic environmental data. The ITU and World Bank recommend that NRAs start with this and gradually expand their mandates to include more types of data and stakeholders.

Reporting requirements case study: Singapore

In Singapore, IMDA does not implement reporting requirements. However, the Accounting and Corporate Regulatory Authority (ACRA) and Singapore Exchange Regulation (SGX RegCo) have introduced regulations for mandatory climate-related disclosures (CRD) affecting all listed and large non-listed companies (those with at least \$1 billion in revenue and \$500 million in assets in 2027). These regulations do not mention ICT companies but will still affect many of them.

Reporting requirements case study: France

In France, sustainability reporting requirements fall to the ICT NRA and specifically target the ICT sector. Data collection is allowing Arcep to successfully measure the environmental impact of the sector in France. Arcep began including requests for environmental data in 2020 in its regular annual data collection questionnaires for telecoms operators. In 2021, the government entrusted Arcep with the implementation of "The Chaize Act", which expanded Arcep's authority to include the collection of environmental data not only from electronic communications operators, but also from online communication service providers, data centre operators, consumer device manufacturers, network equipment suppliers and operating system providers. Data collection was further expanded in 2024 to include cloud computing providers.

¹⁴ <https://openknowledge.worldbank.org/entities/publication/edf9fd64-a6ab-4124-a4ec-d9a2ab70516c>

3.4.

Information sharing and awareness: publications, awareness-raising and certification

Information sharing and raising awareness are ways to gain industry and consumer support for efforts to promote sustainability in the ICT sector. They are unimposing and not mandatory. They are also within easier reach of ICT NRAs; information sharing and raising awareness do not require any special or legislative powers. The lack of a regulatory mandate means they can be adapted to each NRA's capabilities and resources. This allows NRAs to play a direct role in boosting ICT sustainability.

Measures such as these are enabling. They help consumers and ICT companies to make informed decisions about sustainability. Consumers and companies can learn about better sustainability practices, and consumers can hold companies to account. Consumers and industry can, if they wish, significantly influence sustainability through informed purchasing decisions and supply chain sourcing, and public demands for sustainability are growing.¹⁵ However, a lack of awareness and transparency can undermine such ambitions. A survey¹⁶ by Canada's Information and Communications Technology Council (ICTC-CTIC) revealed that 22% of stakeholders struggled to compare suppliers due to a lack of standardised environmental data, while 20% cited insufficient transparency about the environmental impacts of products and services. Additionally, 17% pointed to limited supply chain visibility as a significant challenge. That's where better information sharing and awareness tools come in; they empower consumers and businesses in their choices.

¹⁵ <https://hbr.org/2023/09/research-consumers-sustainability-demands-are-rising>

¹⁶ <https://ictc-ctic.ca/policy-briefs/advancing-environmentally-sustainable-ict-in-canada#report>

The following sections highlight five mechanisms that can play a useful part in the information-sharing and raising awareness process. These are briefly discussed in more detail in the following sections, they are:

- **Publication of standards** to ensure consistency and clarity in sustainability practices
- **Publication of reports, analyses or studies** to provide insights into sustainability challenges, opportunities, and trends
- **Publication of guidelines** to offer clear advice on how ICT companies and consumers can adopt more sustainable behaviours and technologies
- **Consumer and supplier awareness-raising initiatives** such as publicity campaigns,
- **Certifications and labels** to reward good practices and highlight certain brands to environmentally conscious consumers.

Table 5 shows which of these initiatives are implemented by the countries and bodies highlighted in this survey.

	Australia	Canada	France	Singapore	UK	EU	Int. bodies
							
Published standards	✓	✓	✓	✓	✓	✓	✓
Published research	✓	✓	✓	•	✓	✓	✓
Published guidelines	✓	•	✓	✓	✓	✓	✓
Consumer awareness	✓	✓	✓	✓	✓	✓	✓
Certifications and labels	✓	✓	✓	✓	✓	✓	✓

Table 5: Information sharing and awareness

Publication of standards

Standards for ICT sustainability typically focus on energy efficiency and green practices for specific areas of ICT, such as data centres or telecommunication equipment. There are also broader standards, for example, covering energy-consuming products.

ICT NRAs may contribute to these standards, but they are usually published by national governments or international organisations. Table 5 shows that two of the five studied countries' ICT NRAs actively engage in publishing standards, alongside both international organisations studied (EU and ITU).

Publication of standards case study: Singapore

Singapore's NRA, IMDA, has developed the Green Data Centre Standard that aims to promote energy efficiency and sustainable practices in data centre operations. This standard is modelled after the ISO 50001 standard on energy management but is specifically tailored to meet the needs of data centres in Singapore.



Publication of standards case study: ITU

The ITU has developed the ITU-T L.1400 series of recommendations, a set of international standards focused on sustainability in ICT. Key standards here include:

- **ITU-T L.1410:** This provides a standardised methodology for assessing the environmental impact of ICT goods and services throughout their lifecycle.
- **ITU-T L.1300:** This outlines best practices for building and operating data centres.
- **ITU-T L.1350:** This defines energy-efficiency metrics and measurement methods for telecommunication equipment.



Publication of research (reports, analyses or studies)

Most countries publish reports, analyses and studies focused on ICT sustainability. A wide range of topics is commonly covered, from progress in e-waste management to measuring the environmental impact of ICT. While ICT NRAs often publish reports, when it comes to sustainability topics these publications are more often produced by other environmentally focused national agencies or by international organisations. Four out of the seven bodies analysed in this study have actively conducted research and published insights focused specifically on sustainability within the telecom or more general ICT industries.

Research case study: UK

Ofcom, the UK's NRA, has explored the differences in energy consumption between over-the-top (OTT) streaming services and digital terrestrial television (DTT) for TV distribution. This type of targeted research provides valuable insights into the environmental impacts of different technologies.



Research case study: EU

Among its numerous research contributions, the *BEREC Report on Sustainability Indicators for Electronic Communications Networks and Services* stands out as a comprehensive analysis of environmental transparency and sustainability indicators. It conducts an examination of existing indicators employed by EU countries, considers stakeholder perspectives and industry practices related to the availability of information and feasibility of measuring, and ranks the indicators to be prioritised in the reporting of the environmental impact of electronic communications networks and services. The report notes that, while the vast majority of ICT NRAs say they do not have a specific mandate to collect environmental data, four EU NRAs have collected data regarding the environmental footprint of electronic communications. The experiences of these NRAs and industry contributions are documented and three preliminary categories of indicators are proposed.



Research case study: ITU

The Global E-waste Monitor 2024, published by the ITU (in partnership with the United Nations Institute for Training and Research (UNITAR)'s Sustainable Cycles (SCYCLE) Programme and Fondation Carmignac), provides an overview of e-waste management topics, including global statistics, environmental and economic assessments, and technological developments.



Publication of guidelines

Sustainability guidelines or recommendations cover a broad range of topics such as energy efficiency, eco-friendly design and green software development, helping operators to integrate environmental improvements into their projects. Most countries offer a vast range of sustainability guidelines tailored to the ICT sector. Two of the five ICT NRAs studied here are currently publishing sustainability guidelines, recommendations, or best practices to guide the industry. Other government bodies also publish an assortment of guidelines.

Guidelines case study: Singapore

Singapore's NRA, IMDA, in collaboration with Microsoft, has unveiled digital sustainability guidelines promoting green software development. They offer guidance on integrating energy efficiency, carbon awareness and hardware efficiency into software engineering and development processes. The goal is to ensure that applications and solutions are energy-efficient and carbon-aware by design. Its authors say they hope to "accelerate education and awareness among businesses and developers".



Guidelines case study: UK

Although the UK's NRA, Ofcom, does not publish sustainability guidelines for the ICT sector, other UK government bodies do. For instance, Building Digital UK (BDUK), which is helping to bring fast and reliable broadband and mobile coverage to hard-to-reach places, has published the *Building Digital UK Environmental Resource Guide* to assist in the rollout of digital infrastructure. It provides broadband suppliers and mobile operators, alongside subcontractors and agents, with a single reference point for environmental requirements and resources for delivering digital infrastructure in the UK.



Consumer and supplier awareness-raising initiatives

All countries implement consumer or supplier awareness-raising initiatives focused on sustainability. These initiatives often address key ICT topics such as circular economy waste principles, phone refurbishment schemes, and environmentally responsible product choices. Not all ICT NRAs engage in such measures: two of five in this study do, along with the EU and ITU.

Awareness case study: France

Arcep's reports highlight the importance of consumer awareness measures in the drive for sustainability. Arcep therefore publicises some of its key findings to raise awareness. One press release, for instance, highlights a finding that user devices are the largest contributor to digital carbon emissions, accounting for a staggering 79% of the total. The stated aim of the press release is to raise public awareness about the significant environmental impact of consumerism and the frequent replacement of electronic devices.



Awareness case study: EU

BEREC states that it "considers end-users' awareness of environmental issues as critical for end-users' empowerment and for ICT sustainability". In 2023 therefore, BEREC started a fact-finding process to better understand how to increase environmental transparency and empower end users. Following this research, BEREC published the *BEREC Report on ICT Sustainability for End Users: Empowering End Users through Environmental Transparency on Digital Products*. This report aims to help EU consumers who want to play an active role in meeting environmental targets to have sufficient information to make informed choices about their ICT usage. To accompany the report's publication, BEREC published graphics highlighting key stats about devices' environmental impacts. These graphics were published on social media to target end-users (for example, on LinkedIn).



Certifications and labels

Certification programmes and labelling schemes can signal to consumers which ICT brands meet certain environmental standards. Such schemes are an effective way of recognising achievements in areas such as energy efficiency, waste reduction and emissions reduction; data centres and energy-consuming products are often targeted. These schemes offer public recognition as a reward to companies for their sustainability efforts. Only one of the five ICT NRAs and both international organisations studied offer such schemes. However, other government bodies offer them in the countries in which ICT NRAs do not.

Certification case study: Australia

The Australian government's NABERS (National Australian Built Environment Rating System) offers data centres a pathway to achieve Climate Active Carbon Neutral certification, an international, government-backed certification that is aligned to national and international greenhouse gas accounting protocols. Starting in mid-2025, data centres hosting federal agency workloads will be required to achieve a five-star NABERS rating.



Certification case study: Singapore

Singapore's NRA, IMDA, offers the BCA-IMDA Green Mark for Data Centres (GMDC), a certification scheme developed to acknowledge data centre operators that have implemented best practices in sustainability and environmental performance. It aims to encourage the adoption of energy-efficient technologies and sustainable practices within the data centre industry.



3.5. Collaborative and practical initiatives

Collaborative and practical initiatives focus on working directly with stakeholders. These initiatives are all about taking action through building partnerships, providing resources, and equipping people with the practical tools they need to make meaningful changes. Here we will be looking at two approaches in particular. Section 3.5.1 will cover collaboration and engagement initiatives, including industry engagement and public consultations. Section 3.5.2 will cover practical capacity-building measures, including training and financing or grants.

Table 6 provides an overview of how the various initiatives are implemented by the countries and organisations in this study.

	Australia 	Canada 	France 	Singapore 	UK 	EU 	Int. bodies 
Industry engagement	✓	✓	✓	✓	✓	✓	✓
Public consultations	✓	•	✓	•	✓	✓	✓
Training	✓	✓	•	•	✓	✓	✓
Financing and grants	✓	✓	•	✓	•	✓	✓

Table 6: Collaborative and practical initiatives

3.5.1.

Collaboration and engagement: industry engagement and public consultations

Collaborative practices help drive more effective sustainability changes in the ICT sector by ensuring buy-in from companies and by the pooling of efforts. Collaboration by ICT NRAs with industry brings companies on board with the ICT NRA's goals and leverages their insights about challenges. Collaboration also offers a way to tackle challenges that no single player can address alone. Bringing together ICT NRAs, telecom operators and technology providers, and other interested players, such as environmental agencies, can inspire new initiatives to drive sustainability.

Industry engagement

Cooperation between ICT NRAs and industry stakeholders can take many forms, including long-term partnerships, joint research and symposiums for sharing ideas. All the countries studied here engage with industry on ICT-focused sustainability. Three of the five ICT NRAs and both international bodies (EU and ITU) actively engage with industry on sustainability practices.

Industry engagement case study: France

In June 2020, Arcep launched the *Achieving Digital Sustainability* collaboration platform, inviting various stakeholders, including associations, institutions, electronic communications operators, tech companies, other government agencies and experts, to contribute. Collaboration happened at workshops and discussions on the environmental footprint left by networks, devices and users. This work formed the basis of a co-authored report, which includes a diagnosis, contributions from the participants and preliminary proposals for solutions from Arcep.



Industry engagement case study: ITU-ETSI

Organised by the European Telecommunications Standards Institute (ETSI) in collaboration with the ITU, a symposium, *ICT Sustainability: Standards Driving Environmental Innovation*, held in December 2024, brought together industry leaders, policymakers and experts to discuss how the adoption of environmental standards can foster innovation and reduce the adverse environmental effects of ICT technologies.



Public consultations

Public consultations help ICT NRAs to learn about stakeholders' views and, in turn, allow stakeholders to have their views heard, potentially increasing buy-in from stakeholders. By opening the discussion to the public, consultations can promote transparency, accountability, and inclusivity. Four of the seven bodies studied here have actively utilised public consultations on ICT sustainability issues. They have gathered a diverse range of voices – including industry players, policymakers, consumer advocacy groups and the public – to contribute insights and feedback on proposed regulatory actions, policy changes or wider issues affecting the sector.

Consultation case study: ITU

The ITU launched an open consultation to explore new and emerging telecommunications and ICT technologies for sustainable development in 2019. The consultation aimed to gather insights and ideas on leveraging these technologies to address global challenges and promote sustainability. Views could be submitted either online or in person at a meeting. In the following years, the ITU collated opinions, published a report, and held a forum to support ITU Member States in formulating their policies.



Consultation case study: UK

Ofcom frequently publishes public consultations regarding its strategy plans. These consultations have sometimes included sustainability issues. For example, Ofcom's consultation on its *Plan of Work 2022/23* included a section to gather views on Ofcom's role in climate change issues and sustainability within the telecommunications sector.



3.5.2.

Practical capacity building: training, financing and grants

While regulatory and information-sharing measures play a broader role, sometimes the real challenge lies in overcoming specific barriers that can slow down the adoption of sustainability practices. Direct support measures may help to do this. Capacity-building measures, such as the provision of skills or financial resources, are an effective way to drive sustainability where a lack of resources is preventing adoption. According to a survey from the UN-backed SME Climate Hub, two-thirds of SMEs surveyed are concerned about their ability to navigate climate action due to a lack of skills and knowledge (63%), funding (48%), and time (40%).¹⁷

Training

Training and skills development initiatives can be effective forms of capacity building. ICT NRAs in the countries studied here do not currently provide ICT sustainability training initiatives. However, in three of the five countries studied, other government bodies provide ICT-focused sustainability training. Both the ITU and EU also provide sustainability-focused training opportunities in ICT.

Training case study: EU

The EC offers training courses to enhance environmental responsibility in the ICT sector. For example, the ECOTech-ICT: Sustainable Development and Environmental Preservation course equips professionals with the knowledge to integrate sustainable practices into industry, covering topics such as energy efficiency, resource conservation and the environmental impact of digital technologies.



Training case study: ITU

The ITU Academy offers a variety of training courses focused on sustainability, including a course – Circular and Sustainable Public Procurement for ICTs – designed to help professionals and organisations understand the principles and practices of sustainable procurement in the ICT sector.



Training case study: Australia

While Australia's ICT NRA, ACMA, is not currently offering specific training on sustainability in ICT, the Australian government's national training register, Training.gov.au, does include relevant courses. One example is the ICTSUS603 unit, Integrate Sustainability in ICT Planning and Design Projects, aimed at individuals with advanced technical skills in ICT networks, which addresses sustainability in areas such as hardware upgrades and next-generation network installations.



¹⁷ <https://smefinanceforum.org/post/new-data-reveals-two-thirds-of-surveyed-small-businesses-concerned-over-navigating-climate>

Financing and grants

Financing is another form of capacity building that can help companies to implement sustainable ICT initiatives. One of the five ICT NRAs in this study provides financing for ICT sustainability efforts, while two countries have other governmental bodies providing ICT-focused sustainability funding. The remaining two countries have sustainability funding opportunities that are not ICT-sector specific, although they could be used by ICT operators. Both the ITU and EU provide sustainability-focused financing opportunities in ICT, addressing the public or private sectors.

Financing case study: Singapore

Singapore's IMDA has launched a US\$30 million fund to promote research and innovation in 'green' computing. IMDA calls for proposals to invite researchers and industry to co-develop low-carbon digital solutions, focusing on use cases that are currently unfunded.



Financing case study: Canada

Innovation, Science and Economic Development Canada (ISED), while not directly offering funding itself, maintains a database of funding and support opportunities through the inter-departmental government initiative, Clean Growth Hub, which supports cleantech innovation. This platform offers support provided by federal, provincial and territorial governments, which includes funding, loans, wage subsidies, collaboration opportunities and tax credits. In addition, various other Canadian government programs, such as those run by Natural Resources Canada (NRCan) and Sustainable Development Technology Canada (SDTC), provide broader financial support for sustainability and green innovation projects that could be used by the ICT sector.



3.6. Other initiatives

As governments and ICT NRAs continue to drive the sustainability agenda forward, diverse initiatives are emerging across different regions. The initiatives discussed in this section complement and enhance those discussed above by introducing innovative and unique approaches. Some of these initiatives were not implemented by ICT NRAs, but this does not bar interested ICT NRAs from adapting or contributing to them.

Other initiatives case study: Canada

In Canada, the *Green Products Database Pilot Project*, launched by Public Services and Procurement Canada (PSPC), invites businesses to collaborate to develop a database that features environmentally friendly products. The goal is to create a public, searchable database where sustainable products can be easily identified. It is designed primarily to provide federal departments and government agencies with access to a comprehensive catalogue of products and technologies that may be better for the environment. The selection of environmentally certified products will include appliances, IT goods, office furniture, cleaning supplies and more.

Also in Canada, the Clean Growth Hub, a multi-agency collaborative effort, offers tailored advisory support for clean technology developers. The Hub's team of experts helps connect innovators with relevant government programmes, providing hands-on assistance with accessing government support and acting as "Canada's whole-of-government focal point for clean technology". The Hub's mandate is "to help Canadian clean technology producers and users navigate the federal system of clean technology programs and supports."



Other initiatives case study: Singapore

Singapore's IMDA invites industry partners to participate in green software trials that will minimise the carbon footprint of their digital assets. This is a collaborative measure, in which IMDA and participants will gain valuable insights into the reduction of digital carbon footprint and energy consumption. The trial data will also inform the development of guidelines for building green software.



Other initiatives case study: Australia

The Australian government's NABERS has a *Waste Platform* available to companies and organisations for a small fee. Users can upload and track a building's waste data monthly. The platform automatically converts the data into useful management insights. It produces different graphs representing key performance waste metrics that are designed to demonstrate how well a building separates its waste into streams that can be composted and recycled.



4.

Conclusion: What's next and what else can be done?

The overall picture regarding sustainability measures in the ICT sector is encouraging. There appears to be an active effort on sustainability, with most measures discussed being adopted in some form by all five countries studied.

But is this down to the work of the ICT NRAs? While some ICT NRAs incorporate promoting sustainability into their roles in regulating the ICT sector, others do not need to, with the role filled by other environmentally focused government departments. We can say, then, that there is no single approach to tackle sustainability issues; in fact, approaches vary a great deal depending on the authorities in each country as well as on the powers of a given ICT NRA.

Could a more active role by ICT NRAs be welcomed by the sector? Ofcom's consultation regarding its role on sustainability issues received a surprising number of responses encouraging it to do more, including some from telecom operators.¹⁸

So, what could be done? We believe that the following approaches could be suitable for ICT NRAs to lead – or at least for them to encourage, either by promoting their implementation or supporting other authorities:

- **Industry engagement**

This appears to be the single most popular approach by ICT NRAs. Engaging with industry can contribute to a range of NRAs' aims, including awareness-raising, leveraging industry resources or expertise, and obtaining industry buy-in for NRAs' actions.

- **Public consultations**

These provide an example of a structured form of collaboration in which NRAs tend to have experience. They can be a good starting point from which to assess industry appetites.

¹⁸ <https://www.ofcom.org.uk/siteassets/resources/documents/consultations/category-2-6-weeks/ofcoms-plan-of-work-2022/23/associated-documents/plan-of-work-22-23-responses-to-the-consultation.pdf?v=327648> (p.47 covers climate change)

- **Publication of research (reports, analyses or studies)**

This appears to be one of the preferred approaches when it comes to driving sustainability with a light touch and little intervention. ICT NRAs are very well positioned, especially if they have reporting requirements, to gather information from ICT companies (such as telecom operators and cloud providers) and offer comparative KPIs so that sustainability-aware consumers can decide between companies to buy services from.

- **Standards and guidelines**

ICT NRAs can publish standards (if ICT NRA powers allow) and/or publish guidelines to help industry players to implement measures towards sustainability.

- **Raising awareness**

Regulators are also very well-positioned to raise awareness among consumers and suppliers. Here, sustainability certifications can help consumers to make informed choices. They can also help sustainability-aware companies to advertise their products and services.

- **Regulations**

Finally, of course, regulators are good at creating regulations. True, there are not many current examples of ICT NRAs implementing sustainability regulations, though they may one day be permitted to actively nudge industry towards sustainable operations. However, we believe the first step is to measure sustainability, which can be done through reports, analyses or studies mentioned above. They will identify whether there is a need for regulation.

ICT NRAs can use this study to identify gaps and pinpoint measures for the ICT sector that could enhance sustainability. Deploying a wide range of measures could require a collaborative approach across government agencies and industry to make the best use of relevant governmental powers and resources and ensure industry buy-in. That said, many measures are within reach of ICT NRAs acting alone, allowing them to take a proactive role in leading sustainability efforts tailored to the ICT sector.

Of course, the initiatives by international organisations such as ITU and BEREC are also important in bringing efforts together across borders. Nonetheless, we believe there is room for further action: comparing the sustainability of the ICT sector in each country, showcasing frontrunners, and finding the best approaches to drive sustainable ICTs, say. This would help groups like Axon to identify best practices. We certainly could have done with an ICT Sustainability Index, and it could be added to the success stories of the ITU's *ICT Development Index* and *Global Cybersecurity Index*.

Today, ICT NRAs have an opportunity to shape the future sustainability of the ICT sector. Whether acting independently or in collaboration with other government agencies and industry partners, a broad range of initiatives is well within the reach of NRAs. International organisations can play an indispensable role, particularly in helping to identify the most effective initiatives and strategies. Let's not miss this opportunity.

For additional details on this study, specific information per country, or a full list of sources, please feel free to reach out to our marketing team: marketing@axonpartnersgroup.com

Enforcement, empowerment or engagement?



About Axon Consulting

Axon is an international firm founded in 2006 that provides investment and advisory services to a broad client base in the ICT and digital space in more than 70 countries across the world.

Axon's emerging technologies practice is at the core of our work and a growing priority for clients. We focus on strategy, policy, and market intelligence around a broad spectrum of next-generation technologies, engaging both private and governmental stakeholders. By partnering closely with decision-makers, Axon helps them anticipate trends, address critical challenges, and develop actionable roadmaps to harness the full potential of emerging technologies.

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