

# Measuring National ICT Sector Environmental Impact

## **ARCEP CASE STUDY – FRANCE**

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A Joint ITU / World Bank Report



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# FOREWORD

This joint case study by the World Bank and the International Telecommunication Union (ITU) is a continuation of our commitment to improving how we understand and track the digital sector's environmental impact. Building on our previous publications like the "[Measuring the Emissions & Energy Footprint of the ICT Sector: Implications for Climate Action](#)" report and the "[Green Data Centre Guide](#)", this new publication focuses on lessons learned from Arcep's approach to environmental data collection. We believe that these insights will empower regulators worldwide to enhance their national data collection efforts and promote sustainable digital practices.

Arcep, France's regulatory authority for electronic communications, has set a strong example by developing a collaborative framework for collecting and analyzing environmental data in the ICT sector. Through active engagement with industry stakeholders, methodical data-gathering approaches, and support from the government, Arcep is successfully measuring the environmental impact of the sector. This case study highlights Arcep's key strategies and the impact of their data-driven approach, emphasizing how it can serve as a model for effective regulatory practices worldwide.

We call on ICT regulators globally to consider Arcep's approach as an example for their own countries. The urgency of global climate action needs regulators to adopt comprehensive methodologies for measuring the environmental footprint of their ICT sector. As part of the Green Digital Action at COP29 and beyond, there is an opportunity to build a unified global effort to track and reduce ICT sector emissions, to use data to inform decision-making and digital investments. By collaborating and sharing knowledge, challenges, and best practices, regulators can help create a solid foundation that aligns with global climate goals and accelerates the transition to a greener and net zero ICT sector. Addressing the current gaps in data collection is vital to understanding the true environmental impact of the digital sector.



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# 1. INTRODUCTION

The Information and Communication Technology (ICT) sector finds itself at a pivotal moment —while propelling digital transformation across the globe, it is also contributing to climate change. The sector's greenhouse gas (GHG) emissions—estimated at 1.5 to 4 percent of the global total—exceed those of the international aviation industry.<sup>1</sup> Digitalization also impacts other environmental areas such as increased energy and water consumption, raw material depletion, and e-waste.<sup>2</sup> Therefore, the pressing challenge lies in closing the connectivity gap for 2.6 billion who remain offline while leveraging ICTs in an environmentally sustainable manner.

In almost all countries, data collection and analysis of the ICT sector's environmental footprint is limited. As a result, evaluating its environmental impact relies heavily on estimations, which are often available only at a global scale. In the absence of this information, policymakers will encounter challenges in making well-informed decisions about reducing ICT sector emissions, managing energy resources and minimizing other environmental impacts.

Since the impacts of climate change are already noticeable it is essential to reduce emissions across all economic sectors.<sup>3</sup> Available evidence for the ICT sector suggests emissions and energy use are growing. For instance, one report found that the operational GHG emissions of the world's 200 largest digital companies grew 12 percent between 2021 and 2022.<sup>4</sup> Another report estimated that electricity use of the ICT sector grew 8.2 percent between 2020 and 2022.<sup>5</sup> This makes it imperative to monitor the situation. At the same time the widespread adoption of standards for measuring sustainability by digital companies could make ICT a demonstration sector if national authorities compiled the data. Such data could also be used to inform Nationally Determined Contributions (NDCs).<sup>6</sup>

There are a few examples of data collection at the country level which vary in scope and periodicity. These are collected by different types of entities such as utility regulators, national statistics offices and electronic communications regulators. Despite the scarcity of environmental data collected by sector regulators, some telecommunications operators publish data on their emissions and energy use. An ITU / World Bank report aggregated emissions and electricity based on company reports from 30 countries.<sup>7</sup> This illustrates that data could be available from a number of telecommunications operators. For instance, in some jurisdictions,

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<sup>1</sup> ICT sector GHG emissions were estimated at 567 million in 2022 while those of the international aviation industry were 436 million. See ITU and World Bank. 2024. *Measuring the Emissions & Energy Footprint of the ICT Sector: Implications for Climate Action*. <https://documents1.worldbank.org/curated/en/099121223165540890/pdf/P17859712a98880541a4b71d57876048abb.pdf> and IEA, "CO2 emissions in aviation in the Net Zero Scenario, 2000-2030" <https://www.iea.org/data-and-statistics/charts/co2-emissions-in-aviation-in-the-net-zero-scenario-2000-2030>

<sup>2</sup> ITU. 2024. *The Global E-waste Monitor 2024*. <https://www.itu.int/en/ITU-D/Environment/Pages/Publications/The-Global-E-waste-Monitor-2024.aspx>

<sup>3</sup> Body of European Regulators for Electronic Communications (BEREC). 2023. *BEREC Report on Sustainability Indicators for Electronic Communications Networks and Services*. <https://www.berec.europa.eu/system/files/2023-10/BoR%20%2823%29%20166%20Final%20Report%20on%20sustainability%20indicators%20for%20ECN%20ECS.pdf>

<sup>4</sup> ITU and World Benchmarking Alliance (WBA). 2024. *Greening Digital Companies Report 2024*. <https://www.itu.int/hub/publication/d-str-digital-04-2024>

<sup>5</sup> ITU and World Bank. 2024. *Measuring the Emissions & Energy Footprint of the ICT Sector: Implications for Climate Action*. <http://documents.worldbank.org/curated/en/099121223165540890/P17859712a98880541a4b71d57876048abb>

<sup>6</sup> World Resources Institute. 2024. "What Are Nationally Determined Contributions (NDCs) and Why Are They Important?" <https://www.wri.org/insights/nationally-determined-contributions-ndcs-explained>

<sup>7</sup> The World Bank and ITU. 2023. *Measuring the Emissions & Energy Footprint of the ICT Sector: Implications for Climate Action*. <https://www.itu.int/en/ITU-D/Environment/Pages/Publications/Measuring-Emissions-and-Energy-Footprint-ICT-Sector.aspx>

companies are required to disclose environmental data in publicly available reports<sup>8</sup> while in others there are voluntary initiatives to provide such data to a country portal.<sup>9</sup>

In 2023, the ITU surveyed ICT regulators regarding sector emissions plans. It received complete responses to the survey from 75 countries. Key findings included:

- ICT regulators' mandates do not fully capture emerging climate goals and priorities. Currently only one in five regulators are officially mandated to collect emissions data from the ICT sector. However, roughly 40 percent of countries rank emissions monitoring as a high or medium priority and would be willing to undertake actions to that end. Further, 30 percent intend to introduce goals related to emissions monitoring in the future.
- ICT regulators are unfamiliar with but eager to learn about reporting standards and methods. While 72 percent of regulators identified as either slightly or not at all familiar with the GHG Protocol, roughly half emphasized the need for capacity building on climate and environmental issues.

Arcep<sup>10</sup>, the independent French Electronic Communications, Postal and Print media distribution Regulatory Authority, is notable as the first and only sector regulator to regularly publish, within its annual survey "*Achieving digital sustainability*", indicators from data it collects directly from digital players to assess and monitor their environmental impact. This makes it a model for ICT regulators on how to collect and analyze the environmental footprint which combines GHG emissions, energy, and other environmental impacts. This report provides details on how Arcep initiated the process to collect sustainability data, needed legal changes, how and which companies and sectors are surveyed and outputs from the data.

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<sup>8</sup> For example, the Streamlined Energy and Carbon Reporting Regulation (SECR), introduced in 2019, mandates that businesses incorporated in the United Kingdom report on their energy and carbon emissions every year.

<sup>9</sup> This is the case in Brazil. See: <https://registropublicodeemissoes.fgv.br>

<sup>10</sup> The French acronym referring to l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse.

## 2. MANDATE AND REGULATORY MODIFICATIONS

### 2.1 OVERVIEW OF ARCEP

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Arcep was established in 2005 from the then telecommunication regulator ART (created in 1997) due to the addition of postal oversight to its remit. Arcep's responsibilities were expanded considerably to include notably the protection of net neutrality, the regulation of print media, the regulation of data intermediation providers and cloud services, and the measurement of ICT environmental impact.

With a staff of around 185, Arcep actively participates in several regional and international associations. This includes the Body of European Regulators for Electronic Communications (BEREC), FRATEL, a network of French-speaking telecommunications regulators, OECD and the ITU.

Arcep's responsibilities and powers are outlined in the Postal and Electronic Communications Code.<sup>11</sup> The Code includes the mandate for collecting data on the electronic communications sector (e.g., subscriptions, traffic, financial indicators, employment) a task it has carried out since 1999. This activity deepened its knowledge of the electronic communication sector and created statistical expertise. The data and accompanying analysis are published in the quarterly and annual Electronic Communication Market in France observatories.<sup>12</sup>

### 2.2. PATH TO COLLECTING ICT SECTOR ENVIRONMENTAL DATA

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In April 2022, Arcep released the first edition of its annual survey “*Achieving Digital Sustainability*” and became the first sector regulator in the world to publish environmental data of telecommunication operators. This included GHG emissions, energy, and end-user devices (sales of mobile phones by telecom operator, and volumes of mobile phones collected by operators for recycling or reconditioning).<sup>13</sup> This first edition is the result of data collection from telecommunication operators initiated by Arcep in 2020, through its mandate at that time and after deciding on its own to tackle the subject. The initial requests for environmental data were included in the regular data collection questionnaires sent to telecommunications operators for the annual Electronic Communication Market reports.<sup>14</sup> It is worth mentioning that no legal modifications were necessary for Arcep to launch this inaugural report featuring environmental data of telecommunications operators.

Publication of the environmental data for the telecommunications operators has its roots in a note published in 2019 by Arcep about the country's digital carbon footprint.<sup>15</sup> Following on from this note, Arcep launched in

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<sup>11</sup> Code des postes et des communications électroniques at: [https://www.legifrance.gouv.fr/codes/texte\\_lc/LEGITEXT000006070987/2014-01-14/](https://www.legifrance.gouv.fr/codes/texte_lc/LEGITEXT000006070987/2014-01-14/)

<sup>12</sup> Arcep, "Observatoire des marchés des communications électroniques en France" at: <https://www.arcep.fr/cartes-et-donnees/nos-publications-chiffrees/observatoire-des-marches-des-communications-electroniques-en-france/historique-de-lobservatoire.html>

<sup>13</sup> ARCEP. 2022. "Achieving digital sustainability": Arcep publishes the first edition of its annual inquiry." Press Release, 25 April. <https://en.Arcep.fr/news/press-releases/view/n/the-environment-first-annual-inquiry-250422.html>

<sup>14</sup> Arcep, "Décision n°2020-0305 de l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse en date du 26 mars 2020 relative à la mise en place d'enquêtes dans le secteur des communications électroniques" at: [https://www.arcep.fr/uploads/tx\\_gsavis/20-0305.pdf](https://www.arcep.fr/uploads/tx_gsavis/20-0305.pdf)

<sup>15</sup> ARCEP. 2019. Note n° 5 "L'empreinte carbone du numérique." *Réseaux du future Note n° 5*, 21 October. [https://www.Arcep.fr/uploads/tx\\_gspublication/reseaux-du-futur-empreinte-carbone-numerique-juillet2019.pdf](https://www.Arcep.fr/uploads/tx_gspublication/reseaux-du-futur-empreinte-carbone-numerique-juillet2019.pdf)



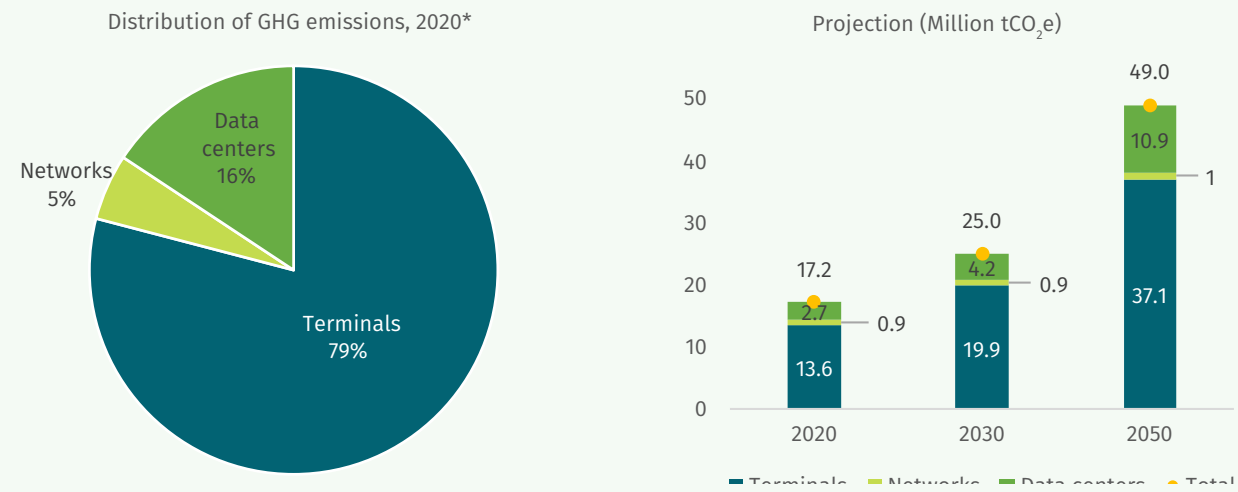
June 2020 a collaborative platform called *Achieving digital sustainability* – calling on all interested associations, institutions, operators, digital industry businesses and experts to contribute.

The many exchanges conducted as part of this platform (workshop, discussions) resulted in the publication, in December 2020, of the *Achieving Digital Sustainability* report.<sup>16</sup> This report put forward 11 proposals for dealing with the ongoing increase in the use of digital technology and reducing its environmental footprint. Above all one of these proposals aims to entrust a competent authority with the power to collect relevant information from the entire digital ecosystem in order to obtain granular and reliable data that is essential to assessing and monitoring the digital environmental footprint. The report also calls for a data-driven approach to regulation to enhance the regulator's traditional toolbox. The intent is that this will result in more transparency to reduce information asymmetries and to help users make informed choices. This concept of data-driven regulation sprang from a note by the French Competition Authority and fellow regulators including Arcep.<sup>17</sup> In the meantime, in August 2020, the government assigned Arcep and ADEME (France's National Agency for the Ecological Transition) the task of assessing the digital environmental footprint in France.

**BOX 2.1: DIGITAL'S CARBON FOOTPRINT IN FRANCE**

A January 2022 report by Arcep and ADEME, on the digital environmental footprint in France in 2020 found that digital technology was responsible for 2.5 percent of the country's carbon footprint.<sup>18</sup> It was estimated that the carbon footprint from digital devices account for most of the carbon impact (79 percent in 2020), followed by data centers and then telecommunication networks (Figure 2.1, left). The report recommended addressing the whole value chain as those three segments are intertwined and influence each other. Furthermore, aside from the carbon footprint, the report also found that digital environmental impacts are not limited to GHG emissions and energy consumption, and that metals and minerals depletion must be considered. The final volume of the report, published in March 2023, featured a prospective assessment of the digital environmental footprint through 2030 and 2050. The report found that if no action is taken, the digital carbon footprint in France could almost triple between 2020 and 2050 (Figure 2.1, right).

**Figure 2.1:** Digital carbon footprint in France



Note: \*Data includes full cradle to grave life cycle emissions.  
 Source: ADEME and Arcep. 2023. "ADEME-Arcep study: assessment of the digital environmental footprint in France in 2020, 2030 and 2050" [https://en.arcep.fr/uploads/tx\\_gspublication/press-kit-study-Ademe-Arcep-lot3\\_march2023.pdf](https://en.arcep.fr/uploads/tx_gspublication/press-kit-study-Ademe-Arcep-lot3_march2023.pdf)

<sup>16</sup> Arcep. 2020. *Achieving Digital Sustainability*. [https://en.Arcep.fr/uploads/tx\\_gspublication/achieving-digital-sustainability-report-dec2020.pdf](https://en.Arcep.fr/uploads/tx_gspublication/achieving-digital-sustainability-report-dec2020.pdf)  
<sup>17</sup> Arcep. 2019. *New regulatory mechanisms – data-driven regulation*. [https://en.arcep.fr/fileadmin/user\\_upload/grands\\_dossiers/La\\_regulation\\_par\\_la\\_data/note-aii-data-driven-regulation-july2019.pdf](https://en.arcep.fr/fileadmin/user_upload/grands_dossiers/La_regulation_par_la_data/note-aii-data-driven-regulation-july2019.pdf)  
<sup>18</sup> ADEME and Arcep. 2022. "The digital environmental footprint in France: ADEME and Arcep submit their first report to the Government." *Press Release*, 19 January, [https://en.Arcep.fr/fileadmin/user\\_upload/04-22-english-version.pdf](https://en.Arcep.fr/fileadmin/user_upload/04-22-english-version.pdf)

## 2. Mandate and regulatory modifications

The ADEME/Arcep study mentioned above showed that end-user devices are responsible for 65 percent to 90 percent of the digital environmental footprint in France and that environmental impact is not limited to carbon emissions. These results corroborate the *Achieving Digital Sustainability* report proposal to extend data collection to the entire digital ecosystem. This proposal came to fruition with a change in law expanding Arcep's mandate for environmental data collection from telecommunications operators to other ICT sector industries. This change to its mandate was voted by the French legislature in December 2021 (Law No. 2 of 23 December 2021).<sup>19</sup>

That law resulted in a revision to the Post and Electronic Communications Code. Section L36-6 gives the power to Arcep for collecting environmental data from telecom operators, terminal manufacturers, data center operators, online communication service providers, network equipment manufacturers and suppliers and operating system providers<sup>20</sup>:

*The Autorité de régulation des communications électroniques, des postes et de la distribution de la presse sets out the rules for:*

[...]

*8° The content and methods of making available, including to third-party organizations listed by the Authority, reliable information relating to the environmental footprint of online public communication services, terminal device, operating systems, data centers, networks, in particular the equipment constituting them, and electronic communications services, as well as the determination of the indicators and methods used to measure it."*<sup>21</sup>

The law and changes to the Post and Electronic Communications Code was then operationalized by Arcep through an environmental data collection decision issued in November 2022.<sup>22</sup> This decision includes data center operators and device manufacturers in addition to electronic communications operators as part of a first round of enlargement of the data collection perimeter, which aims to be progressively extended to the entire digital ecosystem. A questionnaire asking for environmental data was sent to telecommunications operators and the new companies (i.e., device manufacturers and data center operators) in January 2023 with the results published in March 2024 in the third edition of the annual "*Achieving digital sustainability*" survey. Meanwhile, Arcep has continued to gradually extend the scope of environmental data collection. In February 2024, Arcep published its new *Decision on environmental data collection*<sup>23</sup> that expands its data collection to mobile network equipment suppliers, focusing on the main types of hardware that make up a cell site, for publication in 2025 in its fourth edition of its annual "*Achieving digital sustainability*" survey.

However, the December 2021 law and the consequent changes to the French Post and Electronic Communications Code still did not legally allow Arcep to collect data from cloud computing service providers since they were not included in the definition of data center operators in the Post and Electronic Communication Code. This was enabled through Law n° 2024-449 of 21 May 2024 on "Securing and regulating the digital space", specifically Article 34, which extends Arcep's data collection powers to cloud computing providers.<sup>24</sup> For the 5th edition, Arcep plans to extend its data collection to fixed network equipment manufacturers of fiber optic cables.

<sup>19</sup> LOI n° 2021-1755 du 23 décembre 2021 visant à renforcer la régulation environnementale du numérique par l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse. <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000044553569>

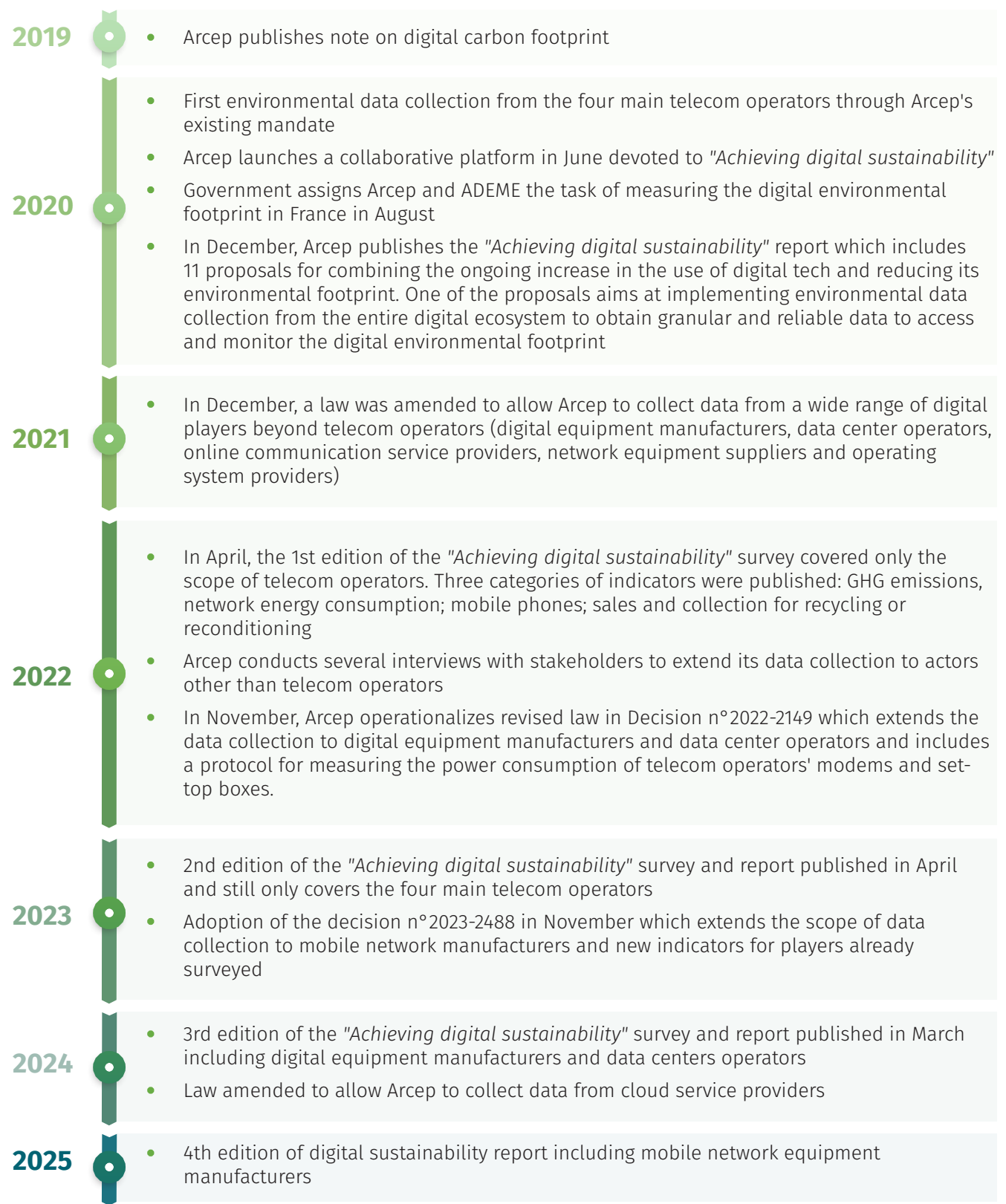
<sup>20</sup> Note that this extends to data center operators that lease space for companies to locate their servers. It does not include companies who own data centers for their own use. Arcep is gradually extending its data collection to all players mentioned in the scope of Article L36-6.

<sup>21</sup> <https://www.legifrance.gouv.fr/codes/id/LEGIARTI000044564896/2021-12-25/>

<sup>22</sup> Décision n° 2022-2149 de l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse en date du 22 novembre 2022 relative à la mise en place d'une collecte annuelle de données environnementales auprès des opérateurs de communications électroniques, de centres de données et des fabricants de terminaux. [https://www.Arcep.fr/uploads/tx\\_gsavis/22-2149.pdf](https://www.Arcep.fr/uploads/tx_gsavis/22-2149.pdf)

<sup>23</sup> Décision n° 2023-2488 de l'Arcep en date du 22 novembre 2023 relative à la mise en place d'une collecte annuelle de données environnementales auprès des opérateurs de communications électroniques, de centres de données, des fabricants de terminaux et des équipementiers de réseaux mobiles [https://www.Arcep.fr/uploads/tx\\_gsavis/23-2488.pdf](https://www.Arcep.fr/uploads/tx_gsavis/23-2488.pdf)

<sup>24</sup> [https://www.legifrance.gouv.fr/loda/article\\_lc/LEGIARTI000049565892/2024-05-23](https://www.legifrance.gouv.fr/loda/article_lc/LEGIARTI000049565892/2024-05-23)

**Figure 2.2:** Timeline of Arcep's activities relating to the ICT environmental footprint

Source: [https://en.Arcep.fr/uploads/tx\\_gspublication/ARCEP-RA2024-TOME-01\\_frise-environment\\_ENG.pdf](https://en.Arcep.fr/uploads/tx_gspublication/ARCEP-RA2024-TOME-01_frise-environment_ENG.pdf)

## 2. Mandate and regulatory modifications

Arcep's experience provides a valuable lesson for other countries on how to collect environmental data for the ICT sector. Consultation and collaboration with stakeholders, from industry players to associations (environmental, consumer and business) and government bodies such as the national agency responsible for the environment are at the core of the process. Arcep's use case highlights the importance of a progressive and adaptive approach — not only in expanding to new sectors but also in continuously enriching the data collected with additional indicators.

Arcep began with telecommunication operators and many national regulatory authorities already collect telecom industry statistics and therefore, no new regulation is likely needed to expand data collection to include environmental data. Furthermore, this existing expertise in collecting industry statistics should initially suffice for collecting basic environmental data for telecommunication operators where there are clear definitions and standards. In addition many telecom operators themselves already publish this data in sustainability reports. Over time, and with changes in the legal framework, Arcep successfully expanded its scope to include other sectors such as data center operators, device manufacturers and mobile network equipment manufacturers. Arcep's approach shows that it is entirely possible to start small, with a limited set of indicators, and gradually build up the data collection process which cumulatively contributes to a more comprehensive understanding of the environmental footprint of digital technology over time. By taking incremental steps, other countries can develop a robust and scalable framework that evolves as their capacity and expertise grow.

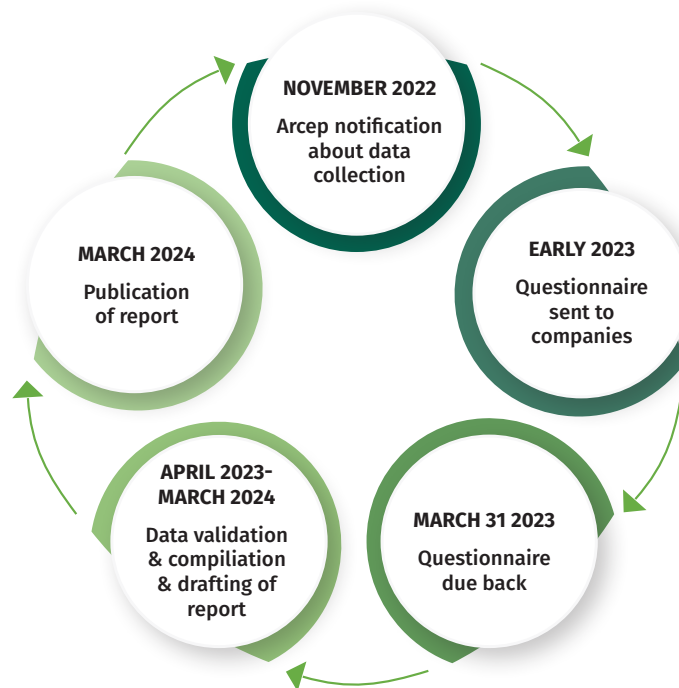
# 3. COMPILATION PROCESSES

## 3.1 OVERVIEW

In 2024, Arcep's annual environmental questionnaires relating to year 2023 data was sent to four types of companies: electronic communications operators, digital devices and mobile equipment manufacturers and data center operators. Companies are selected based on either the number of subscribers they have in France or their French revenue. There are five Excel questionnaires depending on the type of company.<sup>25</sup> The legal basis for the survey are contained in Arcep Decision 2023-2488 of 22 November 2023.<sup>26</sup> This data collection will be the subject of the 4th edition of the survey, to be published in 2025.

For the survey relating to year 2022 data, questionnaires were sent in early 2023 with responses due by 31 March 2023. The data was then validated, compiled and analyzed with the report released in March 2024 (Figure 3.1).

**Figure 3.1:** Data collection, processing and analysis cycle, year 2022 data



<sup>25</sup> The questionnaires sent and the notices: [https://www.Arcep.fr/uploads/tx\\_gsavis/questionnaires-notices-collecte-donnees-environnementales\\_fev2024.zip](https://www.Arcep.fr/uploads/tx_gsavis/questionnaires-notices-collecte-donnees-environnementales_fev2024.zip)

<sup>26</sup> "Décision n°2023-2488 de l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse en date du 22 novembre 2023 relative à la mise en place d'une collecte annuelle de données environnementales auprès des opérateurs de communications électroniques, de centres de données, des fabricants de terminaux et des équipementiers de réseaux mobiles" at: [https://www.Arcep.fr/uploads/tx\\_gsavis/23-2488.pdf](https://www.Arcep.fr/uploads/tx_gsavis/23-2488.pdf)

Companies fill in the Excel sheets and then upload them to Arcep's online database. Staff verify the data using the same process as for telecommunications market data. Data verification, which is time consuming, is based on:

- responses from other companies
- available historical data
- other internal or external data sources
- questions Arcep asks companies about the data collected

Data collection is carried out from start to finish by Arcep, from the drafting of the collection decision to the publication and release of the data. Two persons work full-time on environmental data collection. It is important to point out that Arcep already had statistical resources at its disposal (i.e., a market monitoring unit) when it decided to collect environmental data. Expertise in terms of statistical collection and processing is required, as well as specific skills in the field (measuring environmental impact).

## 3.2 COMPANY SELECTION

It is important to note that the surveys are not intended to question every company in the ICT sector. This would add to Arcep's workload and it would place a burden on smaller companies. Therefore, Arcep has defined selection criteria for in-scope companies based on turnover or the number of subscribers. This covers the main facilities-based telecommunication operators, the leading data center operators and an estimated 70-90 percent of the market for digital devices companies. Arcep has flexibility to expand the number of companies surveyed in the future.

A list of the specific companies surveyed for year 2024 data is shown in the [Annex \(7.2\)](#).

**Table 3.1:** Type of companies in the annual environmental survey

Type of company	Selection criteria	Number of companies	Questionnaire
Digital device manufacturer (only manufacturers who market digital device in France either directly or through a distributor are surveyed) <sup>27</sup>	Turnover > €10 million in France excluding VAT	23	A
Data center operator	Turnover > €10 million in France excluding VAT	19	B
Electronic communication operator	Customers > 3 million in France in the fixed and mobile retail markets combined	4	C.1 & C.2
Mobile network manufacturers	Turnover > €10 million in France excluding VAT	4	D

<sup>27</sup> Estimated to represent between 70-90 percent of the market.

### 3.3 TYPE OF DATA SOLICITED

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The questionnaires specify the exact nature of the data collected. All companies are asked for overall emissions and except for digital device and mobile network manufacturers, electricity use. Additional questions vary depending on the industry of the company.

Emissions data collected is based on ISO 14064-1<sup>28</sup> and the GHG Protocol<sup>29</sup> (Scope 1, Scope 2 (both location and market-based) and Scope 3), although thus far only Scope 1 and 2 are published. Arcep's data collection goes beyond carbon emissions. Recognizing the importance of a comprehensive environmental assessment, Arcep adopts a multi-criteria approach by gathering additional indicators that provide a broader view of environmental impacts across different sectors. For instance, in addition to greenhouse gas emissions, data center operators are required to report water and electricity consumption, which are critical in assessing the sustainability of their operations. Similarly, terminal manufacturers must provide information on the volumes of digital devices they put on the market, categorized by screen size, as well as the amounts of rare earths and precious metals used in production. For electronic communications operators, the data collection extends to the energy consumption of their networks, mobile phone sales, and the volumes of cell phones collected for recycling or reconditioning.

All indicators are precisely defined via definition notices. There is a specific notice for each category of player surveyed. The notices are drafted by Arcep staff on the basis of exchanges with the players surveyed. They are sent to the companies at the same time as the Excel questionnaires for data collection. In addition, they are modified each year to take account of any changes in data collection.

For each of the indicators contained in the questionnaire, the responding company may comment on its responses in the "comments from the responding company" sections, for example on the scope of the indicators, the methodologies used for their calculation, the emission factors, or any other information that the responding company wishes to provide to the Authority.

Arcep works closely with the companies providing the data. Data collection is systematically carried out using a collaborative approach. Arcep works with the companies from whom data is collected at each stage of the data collection process, to create and define indicators (interviews with stakeholders, public consultation on the draft data collection decision) but also to analyze and verify the data once collected. Then, before any publication, the main results of the analyses carried out on the data collected are shared with the companies that provided their data so that they can provide comments. Involvement can vary from one company to another. A lot of actors are involved, whether in the creation of new indicators or in ensuring that the data transmitted is properly understood and/or reliable.

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<sup>28</sup> International Organization for Standardization (ISO). 2018. Greenhouse gases. <https://www.iso.org/standard/66453.html>

<sup>29</sup> <https://ghgprotocol.org/corporate-standard>

**Table 3.2:** Summary of environmental data collected

Indicator	Units	Type of company
<b>Carbon indicators</b>		
Scope 1 GHG emissions	tCO <sub>2</sub> e	All
Scope 2 GHG emissions (location-based)		All
Scope 2 GHG emissions (market-based)		All
Scope 3 GHG emissions		All
<b>Energy/electricity indicators</b>		
Total electricity consumption	TWh	All except digital device and mobile network manufacturers <sup>30</sup>
Total energy consumption	TWh	Telcom operators (network energy consumption; and energy consumption of all modems and set-top boxes used by the operator's customers) and data centers
Electricity per device	watts	Telecom operators (set top box and modems used by operator's customers) and digital device manufacturers (televisions and computer screens; average power in operating and standby modes)
Electricity consumption, and Maximum admissible power for IT device		Data centers
Power Usage Effectiveness (PUE)	Number	Calculated by Arcep from information provided by data center operators <sup>31</sup>
<b>Other indicators</b>		
Devices (TVs, computer displays, portable computers, tablets, mobile telephones) and mobile network device (the main types of hardware that make up a cell site) sold	Number	Telecom operators and digital device and mobile network manufacturers
Collection, reconditioning and recycling of mobile phones, modems and TV set-top boxes	Number	Telecom operators
Volume of water drawn by the data center Type of water drawn	m <sup>3</sup> Freshwater, waste-water, seawater	Data center operators
Cooling systems used		Data center operators
Total data center floor area and area for IT device	m <sup>2</sup>	Data center operators
Volume of rare earths and precious metals required to manufacture devices sold in France	kg	Digital devices manufacturers
Total duration of use of digital device	Months	Digital devices manufacturers
Sales of digital device, segmented depending on device, by screen size and screen technology	Number	Digital devices manufacturers

<sup>30</sup> Note: Electricity consumption is not uniformly collected across all players. For telecom operators: Questionnaire C.1: Captures energy consumption of networks, segmented by network type, operators' data centers, and Internet/TV set-top boxes at customers' premises. Questionnaire C.2: Focuses on "instantaneous" electricity consumption (in watts) of Internet/TV set-top boxes under different scenarios. For data center operators: Questionnaire B: Collects total electricity consumption of data centers and their IT equipment. For digital equipment manufacturers, electricity consumption data is not collected, except for average power usage (in operation and standby mode) for TVs and monitors.

<sup>31</sup> Total data center electricity consumption and IT equipment electricity consumption.



### 3.4 FORTHCOMING SURVEYS

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The fourth edition of the survey, which Arcep will publish in early 2025, will for the first time incorporate data for mobile network equipment suppliers. It will also include new indicators collected from data center operators and device manufacturers.

In future editions, Arcep wants to continue to steadily enhance its collection of environmental data. This includes fixed network equipment suppliers that manufacture fiber optic cables and the incorporation of new indicators for some of the market players that are already being queried.<sup>32</sup> To that end Arcep launched a public consultation in late July 2024 (with replies due by the end of September) to solicit feedback from stakeholders on its future plans.<sup>33</sup>

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<sup>32</sup> <https://en.arcep.fr/news/press-releases/view/n/environment-260724.html>

<sup>33</sup> [https://www.arcep.fr/uploads/tx\\_gspublication/consultation-projdec-collecte-environnementale\\_juil2024.pdf](https://www.arcep.fr/uploads/tx_gspublication/consultation-projdec-collecte-environnementale_juil2024.pdf)

# 4. UTILIZATION OF DATA

This chapter describes how the data is disseminated and used.

## 4.1 DATA DISSEMINATION

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Three digital sustainability reports have thus far been released by Arcep. The data are disseminated in reports available on the Arcep website in French (the press releases are available in English). Each release is accompanied by several outputs. For the *Achieving digital sustainability* released in March 2024, outputs included:

1. A press release<sup>34</sup>
2. A summary of the results<sup>35</sup>
3. An animated presentation
4. An infographic<sup>36</sup>
5. Detailed report<sup>37</sup>
6. Excel spreadsheet<sup>38</sup>

One of the findings was that the companies in the ICT industries surveyed in France generated 1.1 million tons of operational GHG emissions in 2022. Another was that emissions, electricity consumption and water use all increased by more than 10 percent over the previous year in the data center industry. Notably almost 95 percent of the electricity consumption of a set-top box is independent of its use; this suggests steps could be taken to lower its energy draw in standby mode.

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<sup>34</sup> <https://en.arcep.fr/news/press-releases/view/n/the-environnement-210324.html>

<sup>35</sup> <https://www.arcep.fr/cartes-et-donnees/nos-publications-chiffres/impact-environnemental/derniers-chiffres.html>

<sup>36</sup> [https://www.arcep.fr/uploads/tx\\_gspublication/EAPNS2024-infographies.pdf](https://www.arcep.fr/uploads/tx_gspublication/EAPNS2024-infographies.pdf)

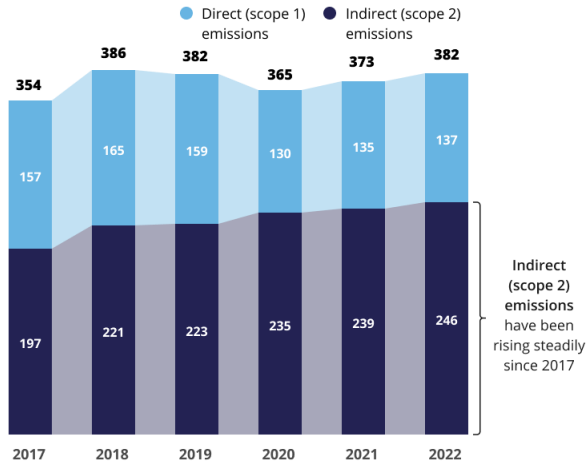
<sup>37</sup> [https://www.arcep.fr/fileadmin/user\\_upload/observatoire/enquete-pns/edition-2024/enquete-annuelle-pour-un-numerique-soutenable\\_edition2024.pdf](https://www.arcep.fr/fileadmin/user_upload/observatoire/enquete-pns/edition-2024/enquete-annuelle-pour-un-numerique-soutenable_edition2024.pdf)

<sup>38</sup> <https://www.data.gouv.fr/fr/datasets/enquete-annuelle-pour-un-numerique-soutenable/>

**Figure 4.1:** Examples of results from “Achieving digital sustainability” survey

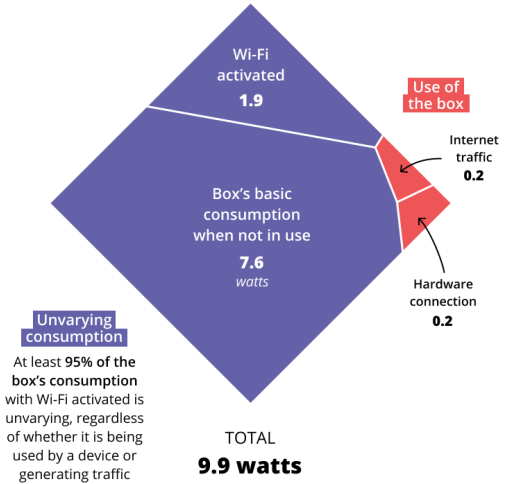
**Telcos’ GHG emissions rose in 2022**

Progression of telecoms operators’ direct (scope 1) and indirect (scope 2) GHG emissions (in thousand tonnes of CO2 equivalent)

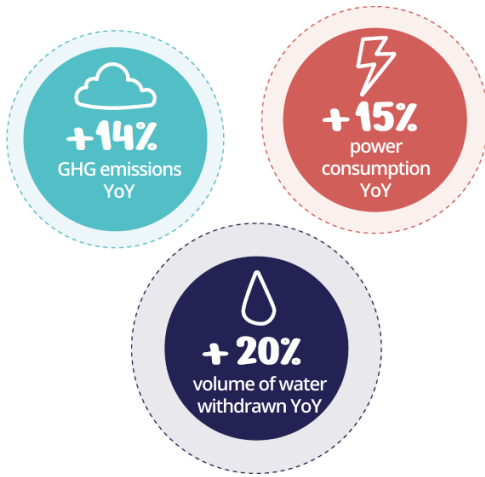


**Close to 95% of a box’s power consumption is independent of the length and intensity of its use**

Breakdown of boxes’ average power consumption (in watts)

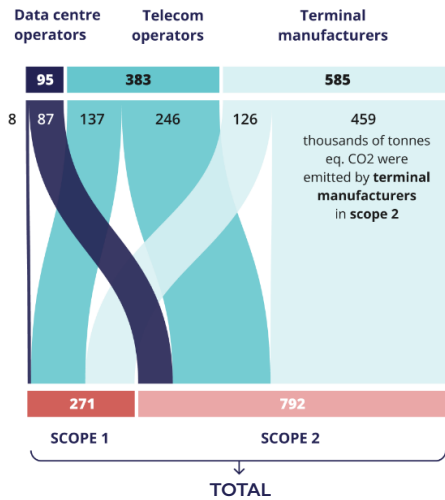


The GHG emissions, electricity and water consumption of data center operators rise by more than 10 percent in one year



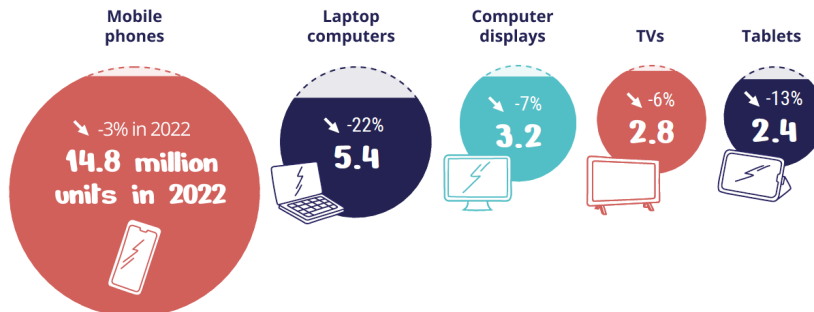
**Emissions from scopes 1 and 2 of the players exceed 1 million tonnes of CO2 eq.**

Breakdown of GHG emissions in 2022 by scope 1 and 2 and by type of player (in thousands of tonnes of CO2 eq.)



**Smaller released volume for every category of new device in 2022**

Million units released in 2022 and YoY growth rate



## 4.2 UTILIZATION OF RESULTS

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There are four main objectives attached to Arcep's annual "Achieving digital sustainability" survey:<sup>39</sup>

1. **Inform** citizens, public sector players and all of the stakeholders on the ICT sector's environmental footprint;
2. **Identify** economic players' activities that are likely to have an impact on the environment;
3. **Encourage** stakeholders to take steps to achieve the most efficient measurement possible of their environmental footprint;
4. **Monitor** the progression of these indicators over time, creating the ability to assess the impact of environmental protection actions put in place by businesses, and to supply relevant information for evaluating public policies on digital and the environment, and particularly Arcep's actions in this area.

For example, the objectives set in the French Government roadmap on "Digital sector and environment"<sup>40</sup> were set based on Arcep's indicators. The aim of this national strategy is to ensure that the digital and ecological transitions converge. It aims to improve knowledge of the various impacts of digital technology on the environment, to control this impact and to harness its potential for innovation in the service of the ecological transition.

Another example, based on the results of its research, especially its environmental data collection, is the publication of a FAQ<sup>41</sup> (in French) offering advice and best practice for citizens on how to limit environmental impact. The Authority recommends, for example, to extend the lifespan of devices as much as possible, and control certain uses of smartphones (uninstall unused applications, set the resolution of videos viewed, etc.).

By publishing these environmental impact indicators, Arcep is also proposing to use data-driven regulation to extend the awareness that has already been created, by providing end-users with relevant information on the energy impacts associated with digital uses, on an objective and unbiased basis.

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<sup>39</sup> <https://en.arcep.fr/news/press-releases/view/n/the-environnement-210324.html>

<sup>40</sup> [https://www.ecologie.gouv.fr/sites/default/files/documents/Feuille\\_de\\_route\\_Numerique\\_Environnement.pdf](https://www.ecologie.gouv.fr/sites/default/files/documents/Feuille_de_route_Numerique_Environnement.pdf)

<sup>41</sup> <https://www.arcep.fr/mes-demarches-et-services/consommateurs/fiches-pratiques/equipements-et-usages-numeriques-comment-limiter-mon-impact-environnemental-au-quotidien.html>

# 5. LESSONS LEARNED AND RECOMMENDATIONS FOR OTHER REGULATORS

## 5.1 LESSONS LEARNED AND CHALLENGES

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When it came to collecting environmental data from digital players, Arcep already had considerable statistical expertise through its monitoring of the French electronic communications sector (which is essential) but it had to develop expertise in measuring environmental footprints and adapt to a new ecosystem of players unknown at the time. To meet this challenge, Arcep has followed a consultative process with the digital and environmental ecosystem from the beginning of its journey to collect environmental data. This consultative process was initiated as part of the 2020 "*Achieving Digital Sustainability*" report, the result of eight meetings between July and November 2020 with trade associations, electronic communications operators, tech companies, civil society stakeholders, government agencies and experts.

The authority co-built its data collection by pursuing the consultative process. For example, in order to extend the data collection to digital devices manufacturers and data center operators, Arcep conducted around 40 bilateral exchanges and four multilateral workshops with a wide range of stakeholders (including environmental and consumer associations and industry representatives) to gather their views on the relevant indicators that could be included in the data collection. It is also important to leave sufficient time for collaboration and a co-construction approach - around two years in Arcep's case was required, from the start of the work to its publication. Arcep also works closely with the industry in the data collection process.

Arcep's collaboration with ADEME, the French environmental authority, has also enabled it to deepen its sustainability knowledge. The study carried out with ADEME showed that digital devices and data centers are notable contributors to digital's carbon footprint, which led Arcep to extend its data collection to equipment manufacturers and data center operators. Furthermore, the study corroborates the importance of adopting a multi-criteria approach; while climate data are critical, it is important to consider the complete environmental footprint of the ICT sector, including use of metals and minerals in digital devices, water consumption and recycling.

Strong backing from the government has been instrumental in achieving legislative changes allowing Arcep to collect data from all relevant companies in the ICT sector ([Annex 7.1](#)).

## 5.2 RECOMMENDATIONS FOR OTHER REGULATORS

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Arcep's experience offers a number of important lessons for other regulators on how to collect and disseminate environmental indicators for the ICT sector.

- **Obtain a data collection mandate.** Having the mandate to collect environmental indicators is critical to ensure that there is high level support for carrying out the activity. This may require some action by the regulator to help achieve the mandate. For instance, Arcep published a report describing the importance of collecting the data which convinced the government to endorse the process.
- **Collaborate and co-build data collection with other stakeholders.** Including companies and entities (environmental experts and associations, industry players, etc.) who want to contribute to the development of the data collection process is one of the most critical factors for success. This phase of dialogue and consultation allows familiarization and knowledge exchange with stakeholders with whom regulators may not usually come into contact with. It also enhances the development of relevant and operational indicators and maximizes the response rates to the questionnaires.
- **Base data collection on indicators and methodologies already used and recognized.** Using indicators and methodologies that are already applied helps to avoid too much workload for companies and regulators and maximizes response rates. Begin with key indicators that are most relevant and standardized, then gradually expand the list as capacity grows and familiarity with the process increases. This phased approach ensures a more effective and sustainable rollout.
- **Begin with the telecom industry.** Many regulators already collect data from telecommunications operators. Based on the experience of Arcep it would appear other regulators could collect environmental data from telecom operators without the need to change any laws or regulations. Starting with the telecommunications sector would likely not require many more resources and would allow regulators to build up capacity before expanding the data collection to other digital industries. Furthermore, if the regulator already collects and disseminates data on the telecommunications sector, it will have expertise for collecting statistics.<sup>42</sup> It is not a giant leap to collecting environmental data as methodologies for emissions and energy data are widely available.
- **Gradually expand to other ICT industries and devices.** It is essential to eventually cover more segments of the ICT sector. As Arcep's analyses indicates, in France there are more emissions coming from data centers and digital devices than telecom operators. Therefore, it critical to collect from all these industries to have a complete picture of the environmental impact of digital ecosystem. However, the main source of emissions differs from country to country and often by level of development. Specifically, cloud services may not be as developed in some countries and the structure of device markets may be not always be formalized. Hence regulators should create a typology of their ICT sector to guide prioritization of environmental data collection.

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<sup>42</sup> Note that the structure of the telecommunications market and the way emissions are accounted for may affect the type of companies data is collected from. This is especially relevant in countries where there are large tower markets. In this case, tower companies may account for a significant portion of telecom sector emissions.

- **Develop in-house skills on the environment.** Training is important so that staff can better understand these new issues, define the right indicators and be able to effectively engage in dialogue with ICT sector actors.
- **Build its own expertise on other experiences.** It is essential to engage in dialogue with other regulators and environmental agencies. This helps to provide a better framework at the national level and request the most relevant data. For example, Arcep has had a close collaboration with ADEME, the French environment agency, from the inception of its sustainability work. Both agencies were charged with responsibility for environmental data on the digital sector. They have also collaborated on several reports.

## 6. CONCLUSIONS AND KEY TAKEAWAYS

Monitoring the environmental impact of the ICT sector is crucial for informed decision-making, especially as the sector's emissions and energy consumption continue to grow. Collecting accurate national data enables regulators to craft effective policies and prioritize sustainability during digital transformation. ICT regulators like Arcep play a critical role by engaging actively in this space, advocating for transparency, and ensuring that environmental considerations are integral to the ICT industry's development.

The lack of reliable national level data poses a challenge to creating effective strategies to reduce the environmental impact of the ICT sector. Arcep's journey to collect ICT sector environmental data began with a legal mandate, culminating in the first annual survey "Achieving Digital Sustainability." Legislative changes expanded its authority to include other ICT industries, setting the stage for comprehensive environmental data collection. Arcep's experience offers valuable insights into the challenges and successes of data collection in this sector. Collaboration with stakeholders, incremental progress, and a focus on transparency are crucial components of the process. The recommendations provided offer a roadmap for other regulators considering similar initiatives.

Arcep's approach to measuring the ICT sector's environmental impact has set an example for how data can be used to drive accountability and foster environmentally sustainable practices. This use case encourages other ICT regulators to adopt a similar approach, starting with telecom data collection, gradually expanding to broader ICT sub-sectors, and continually refining their methods to keep pace with technological advancements and national environmental needs.



# 7. ANNEXES

## 7.1 SUMMARY OF LEGISLATIVE CHANGES MADE FOR THE ANNUAL ENVIRONMENTAL SURVEY

Date	Law / Decision	Remarks
26 March 2020	Decision n°2020-0305 (Arcep)	Notification to electronic communications operators about collection of data for 1st environmental survey. Note that this is simply an Arcep decision advising electronic communications operators about the survey and no changes to laws were required.
16 March 2021	Decision n°2021-0375 (Arcep)	Notification to electronic communications operators about collection of data for 2nd environmental survey. Note that this is simply an Arcep decision advising electronic communications operators about the survey and no changes to laws were required.
23 December 2021	Law n° 2021-1755	Law granting Arcep the right to collect environmental data from a broader range of industries in the ICT sector beyond electronic communications operators.
25 December 2021	Post and Electronic Communications Code, Article L36-6, #8	Revisions to give Arcep the right to collect data from not just electronic communications operators but a range of ICT industry companies including data center operators, terminal equipment manufacturers, mobile and fixed network equipment manufacturers, and mobile.
22 November 2022	Decision n°2022-2149 (Arcep)	Notification to electronic communications and data center operators and terminal manufacturers about collection of data for 3rd environmental survey.
22 November 2023	Decision n° 2023-2488 (Arcep)	Notification to electronic communications and data center operators and manufacturers of terminal devices and mobile network equipment about collection of data for 4th environmental survey.
21 May 2024	Law n° 2024-449 aimed at securing and regulating the digital space	Gives Arcep the right to collect environmental data from cloud service providers.

## 7.2 COMPANIES SURVEYED FOR THE 2024 ANNUAL STUDY FOR DIGITAL SUSTAINABILITY

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1. Electronic communications operators
  - Bouygues Telecom ;
  - Free ;
  - Orange ;
  - SFR.
2. Data center operators
  - Adista ;
  - Amazon Data Services France SAS ;
  - Atos ;
  - Celeste ;
  - Ciril Group ;
  - Cogent Communications France SAS ;
  - Colt technology Services ;
  - Data4 Services ;
  - Digital Realty ;
  - Equinix France ;
  - Free pro ;
  - Hexanet ;
  - Kyndryl France ;
  - Orange ;
  - OVHcloud ;
  - Scaleway
  - SFR ;
  - Sigma informatique ;
  - Telehouse.
3. Terminal manufacturers
  - Acer Computer France ;
  - Alphabet France ;
  - Apple Inc. ;
  - ASUSTek Computer Inc. ;
  - BenQ ;
  - Crosscall ;
  - Dell SAS ;
  - Fujitsu Technology Solutions ;
  - Hisense France ;
  - Honor Technologies France ;
  - HP France ;
  - Huawei Technologies France ;
  - Iiyama ;
  - Lenovo ;
  - LG Electronics France ;
  - Microsoft ;
  - Oppo ;
  - Panasonic France ;
  - Samsung ;
  - Sony Corporation ;
  - TCL ;
  - TP Vision ;
  - Xiaomi.

Source: Arcep 2024. "Annexe 3 : Les Acteurs Interrogés Dans Le Cadre l'enquête Annuelle Pour Un Numérique Soutenable." In ENQUETE ANNUELLE « POUR UN NUMERIQUE SOUTENABLE » 3e Édition – Année 2022. [https://www.Arcep.fr/fileadmin/user\\_upload/observatoire/enquete-pns/edition-2024/enquete-annuelle-pour-un-numerique-soutenable\\_edition2024.pdf](https://www.Arcep.fr/fileadmin/user_upload/observatoire/enquete-pns/edition-2024/enquete-annuelle-pour-un-numerique-soutenable_edition2024.pdf).

