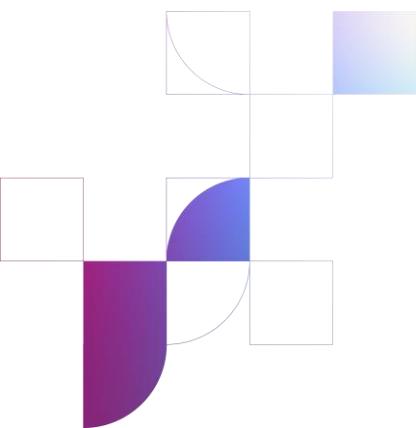


**Summary Report on BEREC internal workshop  
“Telecom regulators' role in the development  
and implementation of sustainability indicators  
in the ICT sector”**

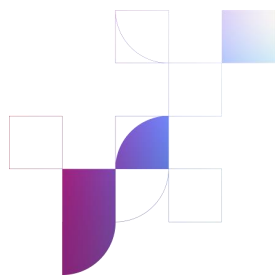
**11 September 2024**



5 December 2024

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## Foreword

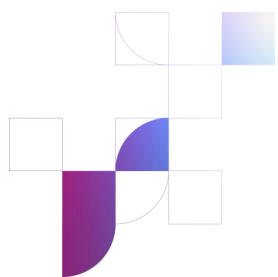
The European Green Deal has set various targets to promote sustainability in the ICT sector, including the implementation of transparency measures for electronic communications. Since 2020, BEREC has included sustainability as part of its strategy and encouraging greater environmental transparency on digital technologies and supporting the definition of robust and relevant indicators to monitor the environmental footprint and performance of ECNs/ECS identifies among its key work priorities. This work aims to increase data availability and reliability in this area and would allow interested parties (economic players, end-users, public bodies) to have a better understanding of the environmental impact of electronic communications. In 2023, BEREC published Report on Sustainability Indicators for Electronic Communications Networks and Services based on internal research, set of technical workshops with stakeholders and a questionnaire that enabled BEREC to collect the feedback from 81 companies and 29 NRAs and public bodies.

Following this report, BEREC continues to contribute to the implementation and collection of relevant and harmonised environmental indicators in the telecom sector. BEREC also aims to support the European Commission in implementing the goal of increased environmental transparency for digital infrastructures, especially the ECN/ECS transparency measures set in its digital strategy “Shaping Europe’s Digital Future” and to contribute to the European Commission’s effort to elaborate a Code of Conduct on sustainability for telecommunications networks and services that should include a list of relevant environmental indicators to monitor.

BEREC included in its 2024 Work Programme the organisation of workshop discussing the role which telecom regulators can play to support environmental transparency in the ICT sector. This workstream aimed at continuing the sharing of experiences between regulators, especially learning from the first National Regulatory Authorities (NRAs) that are collecting environmental data on telecom and digital players. With this work, BEREC also seeks to complete its findings on sustainability indicators regarding technical standards and definitions of the main indicators analysed in its past work. Finally, at this workshop, BEREC members were able to discuss strategic orientations regarding BEREC future role on the topic and to feed future Work Programmes in the area of environmental transparency in electronic communications.

This workshop was organised on 11 September 2024 in Belgrade, Serbia. The event opened on a keynote delivered by Tomas Lamanauskas International Telecommunication Union (ITU) Deputy Secretary General presentations. Two key academic experts, namely Dr Kelly Widdicks (UK Centre for Ecology & Hydrology) and Prof Adrian Friday (University of Lancaster) presented their latest work on measuring ICT impact on the environment. The workshop also included a presentation from the European Commission delivered by Johannes Theiss, Project Manager at DG Connect and Ms Isabella Cerutti Scientific Project Officer at the Joint Research Centre. A group of NRAs, which are collecting environmental data, also shared their experience. The workshop closed with a discussion between BEREC members regarding how the telecom regulators could contribute to the implementation of standardised and reliable sustainability indicators for electronic communications networks.

This summary report provides an overview of workshop’s presentations and main contents.



## 1. Welcome by the BEREC CN Chair 2024

The BEREC Contact Network (CN) Chair 2024, Mr Domagoj Maričić, from the Croatian Regulatory Authority for Network Industries (HAKOM) opened the workshop, welcomed the participants and briefly presented the importance of the topic for BEREC.

Mr Maričić noted that even if the ICT sector is rapidly becoming more environmentally sustainable, there is no straightforward way to achieve these ambitious objectives. He suggested that it is important to have a holistic approach and properly and equally assess the positive and negative aspects that introduction of environmentally sustainable solutions can have, and continue to observe the net impact by carefully assessing the risks in order to avoid being locked in a vicious circle.

Mr Maričić stressed that collaboration between member NRAs and dialogue with all relevant stakeholders is of utmost importance for BEREC as it ensures a more comprehensive understanding of the issues and encourages a collective effort to increase environmental sustainability.

Finally, Mr Maričić noted that outcomes of the workshop will strengthen BEREC's common understanding of the underlying problems and help to identify possible solutions.

## 2. Introduction by the Co-Chairs of the BEREC Sustainability working group

Ms Sandrine Elmi Hersi, one of the Co-Chairs of the Sustainability working group (SUS WG) presented BEREC's activities in the field of environmental sustainability indicators.

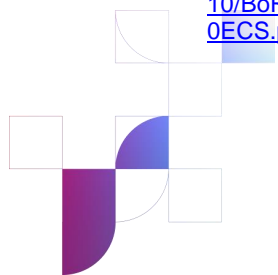
She noted that BEREC has included environmental sustainability in its strategy for 2021 – 2025 and its annual Work Programmes. Through the Sustainability working group, established in 2020, BEREC published its first report “Assessing BEREC's potential contribution to limiting the impact of the digital sector on the environment”<sup>1</sup> in 2022. This report established the four key areas of work on the environmental footprint of ICT. The first identified priority was the issue related to the environmental data availability and definition of common sustainability indicators for the sector.

In October 2023, BEREC published its second report “Sustainability Indicators for Electronic Communications Networks and Services”.<sup>2</sup> This work was based on a literature review, a questionnaire that resulted in 110 feedbacks from NRAs and third parties, and a series of technical workshops with key experts from public bodies, industry, academic community, and civil society.

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<sup>1</sup> [https://www.berec.europa.eu/system/files/2022-07/10282-berec-report-on-sustainability-assessing\\_0\\_3.pdf](https://www.berec.europa.eu/system/files/2022-07/10282-berec-report-on-sustainability-assessing_0_3.pdf)

<sup>2</sup> <https://www.berec.europa.eu/system/files/2023-10/BoR%20%2823%29%20166%20Final%20Report%20on%20sustainability%20indicators%20for%20ECN%20ECS.pdf>



In the report BEREC presented a pilot classification of 19 sustainability indicators, providing key information on the maturity for each indicator. The goal of this classification was to assist the national application of sustainability indicators and to support the work of the European Commission and other relevant bodies on this topic. The 19 indicators include indicators of impact assessments from the PEF methodology and environmental performance indicators (e.g. energy efficiency, reparability, etc.). These indicators are divided into three groups based on two criteria: 1) whether the indicator has been already collected by the NRAs and 2) the level of relevance, based on the feedback from the 81 surveyed companies.

The pilot classification in the report also provides additional information regarding the use of these indicators by private players for environmental reporting, the most relevant scope, and examples of precise metrics/KPIs for regulators to collect.

This classification was used by several NRAs for their own work on environmental data collection and by the European Commission as a source for its recent report on sustainability indicators for ECN/ECSs.<sup>3</sup>

BEREC also outlined other important messages regarding upcoming challenges related to sustainability indicators, many of which will be addressed during the discussion, namely:

BEREC emphasized the importance of robust and common sustainability indicators to encourage the collection and publication of comparable and standardized data. It also underlined the lack of data available on the environmental impacts of ICTs, especially telecom components.

BEREC highlighted the pro-activeness of economic actors and called for the use of new environmental reporting regulations to increase the harmonisation of practices in the sector. It also pointed out the significant role of standards developing organizations (SDO) in addressing remaining technical challenges.

Finally, BEREC underscored the willingness of most NRAs to play a greater role in terms of environmental transparency in the telecom sector, using their examples from ECN/ECS and their data collection practices. It also called for a clear mandate to collect environmental data, in order to secure appropriate resources and base future initiatives on a harmonised framework.

While BEREC's work on sustainability has broadened to include other themes, its focus and interest in sustainability indicators remains ongoing.

The other SUS WG Co-Chair, Ms Kateřina Děkanovská highlighted that the purpose of the workshop is to track the progress made in the development of sustainability indicators at both EU and international levels and to provide an opportunity for strategic discussions to agree on the next priorities for BEREC as it continues to investigate this subject.

BEREC's work on indicators will likely continue next year and beyond. Precisions should be included in BEREC next Work Program for 2025.

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<sup>3</sup> <https://publications.jrc.ec.europa.eu/repository/handle/JRC136475>

### 3. Keynote from Mr Tomas Lamanauskas, ITU Deputy Secretary General

Ms Džekanovská opened the session of external presentations and welcomed the first keynote speaker, Mr Tomas Lamanauskas, ITU Deputy Secretary General.

Mr Lamanauskas noted that ITU is the United Nations (UN) specialized agency for information and communication technologies. For the period 2024–2027, its Member States have set two clear strategic goals: universal connectivity and sustainable digital transformation. For two years, ITU has been also acting as a platform for its members and industry players to come together and address climate-related challenges in the ICT sector.

ITU has issued a number of standards in the area of sustainability, namely: L.1061, L.1300, L.1450, L.1470 and L.1480<sup>4</sup> which are aligned with the Paris Agreement goals and take into account the industry responsibilities as well as help the ICT industry to become a solution to actively address the climate change in a measured way. ITU-T Study Group 5 (SG5) is responsible for studies on methodologies for evaluating ICT effects on climate change and publishing guidelines for using ICT in an eco-friendly way. SG5 work encompasses globally agreed methodologies for measuring the carbon footprint of ICT, to facilitate measurement of their impact on emissions and support meaningful reporting and comparisons.

Other significant part of the ITU activities is its work on statistics and indicators. ITU's data hub is one of the world's richest source of ICT statistics and regulatory information. As part of this work, ITU is establishing a database from the digital industry.

Mr Lamanauskas also added that ITU is actively addressing the climate change and environmental sustainability issues by encouraging operational greening and in particular focusing on the implementation of environmental management system (EMS) which is part of the UN system-wide commitment to advance environmental and social sustainability in policies, programmes, projects and facilities. Mr Lamanauskas also noted that as part of its E-Waste related activities, ITU is helping countries to implement the E-Waste policies.

Mr Lamanauskas presented data regarding the E-Waste. In 2022, out of 62 billion kg of E-Waste only about 22% has been documented, collected and recycled. A result which not only has a significant negative impact on the environment but also means a lost opportunity because a lot of valuable materials, such as metals, are being wasted. Compared to other regions, Europe produces the highest amount of E-Waste per capita but also recycles the most of it.

Recently, ITU has co-authored a number of publications on the subject matter, namely: The Global E-Waste Monitor (2024), Greening Digital Companies (2023) and Measuring Emission & Energy Footprint of the ICT Sector (2024).

The Greening Digital Companies report shows big gaps in digital companies' reporting practices and adherence to science-based target initiative especially related to Scope 3

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<sup>4</sup>For more information about green ICT standards <https://www.itu.int/net/ITU-T/lists/standards.aspx>



emissions. Such lack of harmonised approach in assessing the environmental impact of digital technologies poses a challenge for regulators and scientists to properly evaluate the available data. Nevertheless, ITU believes that it is of utmost importance for regulators to play an important role in collecting environmental data and enforcing sustainability practices.

Mr Lamanuskas underlined that ITU also promotes the multi-stakeholder collaboration through the Green Digital Action,<sup>5</sup> which aims to bring activities together in a single impactful package as well as bring together stakeholders in order to make sure that the ICT industry is capable to address its environmental responsibilities.

In terms of industry performance and the environmental footprint of the ICT sector, ITU is looking into energy and resource intensive areas, such as data centres. Mr Lamanuskas said that it is important to note that while Greenhouse Gas (GHG) emissions, energy consumption and water usage are increasing, the transparency and accountability efforts have declined.

Mr Lamanuskas also presented the ITU's Green Digital Action initiative launched at COP28 together with over forty entities spanning governments, businesses, civil society and fellow UN agencies to step up digital climate action. Green Digital Action comprises of seven thematic pillars and its aim is to enhance collaboration, fast-track industry-wide commitments to address climate challenges, and put digital solutions at the forefront of climate action. The collective efforts resulted in nine key commitments<sup>6</sup> across four thematic pillars during seven GDA sessions and nineteen partner events.

Finally, Mr Lamanuskas announced that on 16 November 2024, during the COP29, there will be the Ministerial Roundtable on Digital Action Path 4 Green World. At the first ever Digitalization Day in COP history, the Ministerial Roundtable will explore how digital technologies can transform climate action. The roundtable will conclude with the adoption of the first Ministerial Declaration, affirming the vital role of digital technologies in climate action and outlining a collaborative framework for advancing sustainability

Mr Lamanuskas closed his keynote by reaffirming the importance of collaboration between different industry players and especially the regulators. He thanked the BEREC Sustainability working group for the invitation to speak at the workshop and reassured that BEREC and ITU closer collaboration will continue to develop in the future.

#### **4. Keynote from Dr Kelly Widdicks (UK Centre for Ecology & Hydrology) and Prof Adrian Friday (Lancaster University)**

Ms Děkanovská welcomed the second keynote speakers, Dr Kelly Widdicks (UK Centre for Ecology & Hydrology) and Prof Adrian Friday (Lancaster University).

Dr Widdicks noted that the ICT has an environmental impact through all stages of its lifecycle: embodied emissions (extraction of raw materials and manufacturing processes), use phase

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<sup>5</sup> <https://www.itu.int/initiatives/green-digital-action/>

<sup>6</sup> <https://www.itu.int/initiatives/green-digital-action/impact/all/>

emissions (energy use for running and maintenance) and end-of-life emissions (disposal of old digital technologies). In their work, Dr Widdicks and Prof Friday are aiming to identify the ICT emissions by also taking into account indirect social, environmental and material costs. According to the recently updated estimation, the ICT sector's global impact accounts for 2.1-3.9 % of global GHG emissions.

Regarding the future of ICT, there are quite a lot of differences in predictions. One of the assumptions is that energy efficiency reduces the carbon footprint. However, when looking at the historical data, it emerges that the greater demand for computation and number of devices per capita is outpacing the efficiency improvements and creating a phenomenon known as "rebound effect".

Dr Widdicks added that another challenging question is whether ICT is enabling carbon savings in other industries. For example, she argued that the rise of videoconferencing has coincided with a rise in global emissions due to air traveling, so it is not clear that the carbon footprint of physical meetings has been replaced by digital alternatives. Rather, while some physical meetings will have been replaced, virtual meetings have arguably supplemented and may even have enabled growth in physical travel. Furthermore, intensive use of renewable energy sources in the ICT sector might result in their lesser availability for other sectors. On this note, Prof Friday added that there needs to be sensitivity regarding the physical location and resource impacts of especially high energy consumption technologies such as data centres. Critical assessment is needed considering their impact on the local communities' land, energy and water infrastructures to ensure their needs are not overlooked.

Prof Friday presented an example of technology deployment, which clearly shows that while coverage of newer technologies such as 5G is expanding, the older ones such as 3G and 4G have not been phased out completely. Therefore, a layering of technologies can be observed across Europe. Another issue is that innovation of digital technologies is often done without considering their potential carbon footprint early enough i.e. when products are proposed or developed rather than after they're released (for example the rapid adoption of LLMs/AI<sup>7</sup>). Once deployed, they form infrastructures which have substantial lifetime impacts. Standards and metrics issued by regulators thus are critically important to address this.

Finally, Dr Widdicks endorsed the work on the sustainability indicators done by BEREC. She noted that more harmonised common approach and greater transparency will help to understand the baselines and where the improvements are actually needed. The transparency will in turn allow ECN/ECS to understand what each player is doing and share the best practices in working towards adopting the common indicators.

Dr Widdicks suggested that it is important to order the groups of indicators identified by BEREC based on evidence and according to the importance for addressing environmental sustainability rather than ordered by the level of support by NRAs or companies. This needs to ensure that actions are not only transparent but also remain relevant to the core environmental issues at stake. For more details on their findings she invited to consult the papers "The real climate and transformative impact of ICT: A critique of estimates, trends and

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<sup>7</sup>For a concrete example of Large Language Models (LLM) impact see <https://doi.org/10.1371/journal.pcbi.1009324>



regulations” (2021)<sup>8</sup> and “Systems thinking and efficiency under emissions constraints: Addressing rebound effects in digital innovation and policy” (2023).<sup>9</sup>

## 5. Joint Presentation by Mr Johannes Theiss (DG Connect) and Ms Isabella Cerutti (Joint Research Centre)

Ms Děkanovská welcomed Mr Johannes Theiss (DG Connect) and Ms Isabella Cerutti (Joint Research Centre).

Mr Theiss thanked BEREC for the invitation and noted that sustainability and the twin green and digital transition are among the key priorities for the European Commission (EC). Among the actions undertaken in this domain in the recent years, Mr Theiss mentioned the Action Plan on Digitalising the Energy System (2022)<sup>10</sup> which had two main objectives: to explore the possibility to develop common indicators for measuring the environmental footprint of ECSs and to establish an EU Code of Conduct for the sustainability of ECNs. In March 2024, the JRC published technical report “Identifying common indicators for measuring the environmental footprint of electronic communications networks (ECNs) for the provision of electronic communications services (ECSs)”.<sup>11</sup> Mr Theiss also mentioned the “Interpretation/implementation Notice on Taxonomy Climate Delegated Act” (2023)<sup>12</sup> in which ECNs are not included as their main purpose is not emission reduction (consideration only in combination with specific services, e.g., M2M communication infrastructure to be used for precision farming) and “The EC White Paper – How to master Europe’s digital infrastructure needs?” (2024)<sup>13</sup> where digital infrastructure’s environmental sustainability challenges were mentioned and especially a link with sustainable investments was made.

Ms Cerutti presented the relationships between the EU regulation and environmental sustainability indicators. She provided a list of examples of the EU directives and regulations focusing on environmentally sustainable finances (e.g. taxonomy regulation) and policies (e.g. eco-design directive) as well as the EU recommendations (e.g. Life Cycle Assessment method) and codes of conduct (e.g. Code of Conduct for data centres and the future Code of Conduct for ECN/ECS). As part of the work on the Code of Conduct for ECN/ECS, the JRC conducted a research on technical documents that are relevant for the policy initiatives (e.g. EU Taxonomy, EEECC review, Digital Decade). The main references were “The JRC Assessment Framework for Data Centres in the Context of Activity 8.1 in the Taxonomy Climate Delegated Act”<sup>14</sup> and the JRC report.<sup>15</sup>

<sup>8</sup><https://doi.org/10.1016/j.patter.2021.100340>

<sup>9</sup><https://doi.org/10.1016/j.patter.2023.100679>

<sup>10</sup><https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0552&qid=1666369684560>

<sup>11</sup>[https://joint-research-centre.ec.europa.eu/scientific-activities-z/green-and-sustainable-telecom-networks\\_en](https://joint-research-centre.ec.europa.eu/scientific-activities-z/green-and-sustainable-telecom-networks_en)

<sup>12</sup>[https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C\\_202300267](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C_202300267)

<sup>13</sup><https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2024%3A81%3AFIN>

<sup>14</sup><https://e3p.jrc.ec.europa.eu/publications/assessment-framework-data-centres-context-activity-81-taxonomy-climate-delegated-act>

<sup>15</sup>[https://joint-research-centre.ec.europa.eu/scientific-activities-z/green-and-sustainable-telecom-networks\\_en](https://joint-research-centre.ec.europa.eu/scientific-activities-z/green-and-sustainable-telecom-networks_en)

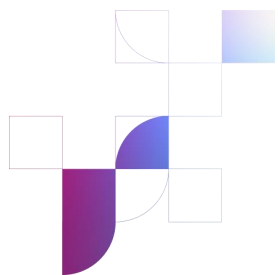
The BEREC work on environmental sustainability and the list of identified indicators was referenced in the JRC report which will be used for defining the Code of Conduct for ECN/ECS. Ms Cerutti explained that initial steps towards the new Code of Conduct for ECN/ECS were based on the engagement with different stakeholders and definition of the most important indicators and their targets. Ms Cerutti noted that it is important to identify the standards that are most relevant for the different indicators because it is necessary to have a standardisation and data collected for each indicator. The Code of Conduct for ECN/ECS will be based on best practices that are optional or expected and, where possible, the network will be broken down in different segments/levels (RAN, FAN, backbone, server farms/data centres, organisation/facilities). The first draft of the Code of Conduct for ECN/ECS has been distributed to the interested stakeholders for comments. Based on the received feedback the draft will be adjusted in terms of length and scope (e.g. practices optional for server farms/data centres, organisation/facilities). The final version of this Code of Conduct is planned to be published by the end of 2025.

## **6. Discussions among BEREC members on telecom regulators' role supporting environmental transparency in the ICT sector**

The workshop ended with a closed discussion among BEREC members to encourage sharing of experiences and to propose strategic orientations for future work in relation with sustainability indicators for electronic communications and environmental transparency.

The key theme was the lack of reliable, standardized data to assess the environmental impact of digital technologies, prompting some NRAs to implement their own data collection initiatives. Four NRAs presented their experiences of designing and implementing environmental data collection, namely Arcep, BIPT, BNetzA and Nkom:

- Arcep began gathering environmental data from operators since 2020, progressively expanding its scope over time. In 2022, it included also devices manufacturers and data centre operators. The goal is to assess environmental impacts, support decision-makers, and encourage green practices among industry players. The key indicators include GHG emissions, energy consumption and recycling rates, with the data being used to improve sustainability practices across the digital value chain.
- BIPT conducted voluntary studies, supported by an external consultant. The indicators considered there included energy and electricity consumption, renewable energy use, GHG emissions, E-Waste and water consumption. In the future, BIPT would like to expand their research to achieve a clearer understanding of the actions that the operators are taking or could be taking.
- BNetzA implemented a voluntary data collection towards electronic communications operators. The indicators covered by the data collection included energy, GHG emissions, and circular economy indicators. It emphasized the need for harmonised standards and data collection to reduce the reporting burden on companies and improve data comparability across the EU. BNetzA therefore supports the Code of Conduct for ECN/ECS which will be issued by the European Commission.



- Nkom focuses its activities on reducing the negative impact of the ICT sector while aligning its work with international frameworks. It is conducting an analysis of the ICT infrastructure's environmental footprint and plans to expand its sustainability strategy to address emerging technologies and the growing importance of data centres. Nkom insists on the need of alignment of indicators and methodologies. It used in its study the assessment methodology from the French authority ADEME and ITU L.1450 standards.

Overall, these presentations highlighted the need for collaboration, standardized methodologies, and a comprehensive approach to address the ICT sector's environmental footprint.

A larger discussion was then opened among the BEREC members. A key point highlighted during the discussion was the importance to establish a clearer mandate at EU level to enable NRAs to collect environmental data on digital players with more efficiency and higher grade of harmonisation. NRAs also insist on the need to build harmonised definitions of indicators and a coordinated approach on the topic, taking into account the existing standards and methodologies. BEREC members underlined their willingness to keep contributing to the establishment of a Code of Conduct on ECN/ECS sustainability currently prepared by the Commission. This initiative is seen within BEREC as an opportunity to promote a list of common, robust sustainability indicators for the sector and to establish targets or best practices to minimise the environmental footprint of electronic communications.

## Conclusions and acknowledgement

BEREC thanks the participants to this work on telecom regulators' role supporting environmental transparency of ICT. It will continue to provide its expertise on digital markets to help building and implement robust indicators to measure and monitor the environmental footprint of electronic communications, including through the upcoming European Code of Conduct on ECN/ECS. More largely, BEREC will pursue its work to support the green transition of digital players and enable ICT to play an enabling role in reaching international and European environmental targets, including the Paris Agreement<sup>16</sup> and UN Agenda 2030.<sup>17</sup>

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<sup>16</sup> <https://unfccc.int/process-and-meetings/the-paris-agreement>

<sup>17</sup> <https://sdgs.un.org/2030agenda>

