Environmental sustainability regulatory and policy practices and actions of telecoms regulatory authorities

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ABSTRACT *Creating climate-neutral electronic communications is a shared responsibility for the industry and urgent action is needed in the face of warming trends due to global climate change. Despite this, environmental sustainability has just started to receive attention in the regulation of the electronic communications sector. The national telecoms regulatory authorities overseeing the sector in the different countries are key in driving related policy and regulation. However, as to date, hardly any paper has dealt with their respective practices in a comparative manner. Therefore, the aim of this paper is to fill this gap, to review the relevant environmental sustainability regulatory and policy practices and actions of telecoms regulatory authorities, in order to provide a comprehensive and high-level comparison of sustainability initiatives in the electronic communications sector. It is hoped that this will serve as a starting point for launching a discourse in the industry and for properly positioning the green transition in electronic communications regulation.*

KEYWORDS *sustainability; carbon neutral; environment; telecommunications; climate change; emissions; net-zero targets*

1. Introduction

This paper will review the relevant environmental sustainability regulatory and policy practices and actions of telecoms regulatory authorities, thus providing a comparison of sustainability initiatives in the electronic communications sector.[1]

Sustainability or sustainable development is a broad concept, lacking a clear definition. The 2012 UN Resolution 66/288 describes sustainable development as the development towards *an economically, socially and environmentally sustainable future for our planet and for present and future generations*[2]. This may include the protection of the environment, climate, fair trade, biodiversity, public health, or animal welfare. Sustainability in general means choosing

[1] Manuscript finished on 30 June 2022.

[2] UN General Assembly, Resolution A/Res/66/288 of 27 July 2012, RIO + 20.

actions today that do not limit the economic, social and environmental opportunities of future generations.[3]

Over the past few years, attention to climate change and sustainable development has risen dramatically among policymakers and lawyers, as well as in society as a whole. For example, in 2015, the Paris Climate Agreement was signed[4] and seventeen Sustainable Development Goals were set[5]. In late 2021, the COP26 conference[6] agreed on two main initiatives, the Glasgow Climate Pact and the Paris Rulebook. The Glasgow Climate Pact, a series of decisions and resolutions that build on the Paris accord, set out what needs to be done to tackle climate change. The Paris Rulebook, on the other hand, gives the guidelines on how the Paris Agreement is delivered. A key focus of COP26 *was to secure agreement between all the Paris signatories on how they would set out their nationally determined contributions to reduce emissions.*[7]

It is no wonder that environmental sustainability is an increasingly pressing issue in electronic communications as well.

The operation of electronic communications networks and services consumes a lot of energy and resources, so energy (and operational) efficiency is a key factor in service design. According to the laws of physics, a certain amount of energy is required to transmit a unit of data, and transmitting the data itself typically consumes more energy than processing that data.[8] The energy efficiency ("EE") of a communication link is usually expressed in terms of the ratio of the maximum data rate achievable to the energy required (bit per joule) (Hou, 2022, 3).[9] The more favourable this ratio is, the more energy efficient a technology is, and operators will prefer the most energy-efficient solutions.

Despite energy and operational efficiency being in the genes of the industry, the green transition is beginning to be seen as an explicit policy criterion and regulatory objective. Recently, there have been a growing number of regulatory initiatives specifically addressing the environmental sustainability of the electronic communications sector. The electronic communications industry, and digitalisation in the broader sense, are playing a key role in the environmental

[3] Gro Harlem Brundtland, *Report of the World Commission on Environment and Development: Our Common Future. United Nations* (Oslo, 1987). https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf.

[4] Paris Climate Agreement, 12 December 2015, Treaty Series 2016, no. 162 (to combat man-made climate change).

[5] The 2030 Agenda for Sustainable Development, A/RES/70/01, United Nations.

[6] "COP26: Together for our planet" – Climate Actions, United Nations, https://www.un.org/en/climatechange/cop26.

[7] Dominic Carver, "What were the outcomes of COP26?," January 27, 2022. https://commonslibrary.parliament.uk/what-were-the-outcomes-of-cop26/#:~:text=The%20COP26%20international%20climate%20conference,degrees%20of%20warming%20within%20reach.

[8] Andrew S. Tanenbaum, David J. Wetherall, *Computer Networks* (Prentice Hall, 2010): 100.

[9] Yanqiao Hou, *Evaluation of energy efficiency in mobile cellular networks using a fluid modeling framework* (Université Paris-Saclay, 2022). 3.

transformation of other industries and are facing further significant growth. However, this growth may even increase the overall environmental burden, making it particularly critical to strike the right balance in related policies. Nevertheless, current decisions already determine the environmental burden that will escalate by 2030 and beyond, due to the overall life cycles of electronic communications infrastructures, so making electronic communications climate-neutral is a responsibility shared among the industry, and global warming trends require urgent action.

Several major countries have already included sustainability as a goal into their strategic plans for the following years. Relevant examples include the Spanish NRA CNMC, which has included multiple sustainability objectives in its Strategic Plan (2021-2026) and Action Plan (2021-2022), or the UK, which mentions sustainability actions and importance of communications actors in reaching its net-zero carbon targets multiple times in its most recent Action Plan (2022-2023).

Other authorities, such as the Hungarian NRA NMHH, are planning to include environmental questions in their 2021 annual online consumer survey and are considering a workshop and consultation with stakeholders[10]. Furthermore, on the potential of partnering up with other institutions, the Maltese authority MCA has already consulted a number of stakeholders including the Maltese Environmental Authority (ERA) with whom it discussed possible future collaboration, once there is a more developed holistic strategic direction on environmental matters[11]. However, several countries' telecom regulators, such as that of the Czech Republic, Romania, Cyprus, Estonia or Greece do not seem to have yet taken any major or concrete actions towards incorporating sustainability as a key priority in their strategies or plans of actions.

It is also worth noting that at European level, in 2020, BEREC started to develop its knowledge regarding the topic of environmental sustainability within the digital sector. As most National Regulatory Authorities were confronted with this new experts' topic, BEREC created a forum where NRAs can learn from each other, develop a knowledge base and deepen their insights on the subject, to acquire a high level of expertise. As a result, the Body has recently adopted a draft report which has also been submitted for public consultation.[12] Nevertheless, the study also suggests that there are a number of potential regulatory measures that can be used to take meaningful action: raising awareness among consumers and network operators, developing codes of conduct with stakeholders, promoting eco-design and recycling programmes,

[10] BEREC, "Draft BEREC Report on Sustainability: Assessing BEREC's contribution to limiting the impact of the digital sector on the environment," March 10, 2022.
[11] Ibid.
[12] Ibid.

encouraging research on sustainability in the ICT sector and promoting sustainability solutions.[13]

BEREC's Strategy 2021-2025 spells out that it will assess ways to contribute constructively to environmental sustainability, both internally (in the running of BEREC as an organisation) as well as externally (by assessing the possible impact we can have as regulators).[14]

Given this context, this article will look at national regulatory agencies that did adopt sustainability-focused measures and explore varied types of commitment of their telecom regulatory agencies. Considering the regional reach and general scope of BEREC, as well as the fact that its work is reflecting national initiatives, it will not explore the actions taken by this particular institution, but will focus solely on national level actions.

After this introductory section, the paper reviews the various relevant environmental sustainability regulatory and policy practices and actions of telecoms regulatory authorities. After outlining the situation in each of the selected countries, the paper concludes by briefly comparing their actions and then suggests possible directions for regulatory action.

2. Overview of the approach of national regulatory authorities

2. 1 United Kingdom (Ofcom)

As declared on their website in the section dedicated to „Environmental policy", the regulator of the United Kingdom (Ofcom) has a strong commitment to protecting the environment: *Ofcom understands that we are in challenging times in terms of global environmental impacts. We all have a part to play in addressing threats to our planet natural systems and biodiversity. Ofcom is therefore committed to assessing, understanding, and finally improving its environmental performance.*[15]

This commitment is reflected in the actions taken at legislative level, with environmental legislation and Government policies on Environmental best practices to be adopted. This includes fighting pollution and adoption of policies to minimize the environmental impact for the life cycle (including disposal) of materials, products, vehicles, equipment, and any other physical assets under their control. Ofcom also pledged commitment to setting up environmental objectives and targets and review their negative environmental impacts.

[13] Ilsa Godlovitch, Aurelie Louguet, Dajan Baischew, Matthias Wissner, Anaelle Pirlot, *Environmental impact of electronic communications* (Bad Honnef: WIK-Consult, 2021) https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/10206-external-sustainability-study-on-environ_0.pdf, 9–12.

[14] Ibid.

[15] Ofcom, "Environmental Policy," published May 3, 2022. https://www.ofcom.org.uk/about-ofcom/policies-and-guidelines/environmental-policy.

The regulator has also implemented policies and procedures to ensure a high degree of sustainability of its operations, in its aim to *develop, implement, and maintain a compliant ISO14001:2015 Environmental Management System (EMS)*[16] as well as part of its *Reduce, Reuse, Recycle initiative*.[17] Relevant examples include a more prominent environmental management within the strategic direction of the organisation, as well proactive initiatives against actions that are harmful for the environment, such as sustainable resource use and climate change mitigation.

At a strategic level, Ofcom has included the topic of sustainability within its annual work programme for 2022/2023. The plan mentions the COP26 conference[18] in November 2021, where world leaders gathered to address the critical issue of climate change, including setting ambitious net-zero carbon targets. The UK's net-zero carbon target is a goal towards which Ofcom vouches to continue its collaboration with companies from all sectors of activity.

In the document, Ofcom recognized the role that communications services, both fixed and wireless services, play in *enabling the reduction of carbon emissions* and the transition to net-zero carbon *as we aim for a more sustainable society*. This can be done through reducing travel, and increasing network durability, or enabling services such as smart meters in homes or satellites to monitor climate change.

Moreover, in order to have networks and services that are fit for the long term, the document states that communications companies need to continue to invest in long-term sustainable policies, which is something that many of them have already pledged to do. This enables the UK *to become more efficient, productive and empowered to tackle the broader environmental challenge.* In that spirit, Ofcom pledges to *continue to engage with industry on sustainability matters and to prioritize efforts towards achieving the UK's net-zero carbon target*.[19]

Last but not least, Ofcom announced that is planning to publish a paper on this topic.[20]

2. 2 The Netherlands (ACM)

The Netherlands has adopted a strong position towards sustainable policies which were reflected in its legislative actions early on, currently being of the key priorities of the telecom regulator. In 2019, the Dutch government adopted

[16] Ibid.
[17] Ofcom, "Ofcom's Plan of Work 2022/23," March 25, 2022, 53.
[18] Website of UN Climate Change Conference UK 2021 https://ukcop26.org/
[19] Ofcom, "Ofcom's Plan of Work 2022/23," March 25, 2022, 30.
[20] "Draft BEREC Report on Sustainability: Assessing BEREC's contribution to limiting the impact of the digital sector on the environment," March 10, 2022, 16.

the Dutch Climate Act,[21] which set as objectives a 49% reduction of greenhouse gas emissions by 2030, a 95%-reduction by 2050, and a 100% carbon neutral energy production in the Netherlands by 2050. In addition, the Supreme Court of the Netherlands in late-2019 ruled that the State of the Netherlands is obliged to make sure that greenhouse gas emissions will have been reduced with 25% by late-2020 compared with 1990.[22]

The Dutch NRA and competition authority ACM published draft Guidelines in January 2021 concerning sustainability agreements and the implications for competition.[23] In these guidelines, sustainability is named as one *of the key priorities*, the NRA recognizing that *agreements between undertakings can contribute in an effective manner to the realization of public sustainability objectives* and *strengthen the support for the efforts that are needed for the realization of those objectives*.[24] In the document, the ACM offers a *practical explanation of the application of competition rules on sustainability agreements*, explaining what type of sustainability agreements are allowed, and how ACM deals procedurally with questions about sustainability agreements. Besides case studies and concrete examples, the Guidelines also enable undertakings to conduct *self-assessments* of their planned sustainability agreements.

In 2021, the chairman of the Authority also delivered a speech[25] about the agreement reached in European Climate Law which had the goal of reducing green-house emission with 55% by 2030. He suggested that for certain types of agreements the fair share test is met if the benefits to society as a whole outweigh the negative effects to consumers, as opposed to the proposal spoken about, which would be that the benefits to consumers at least compensate them for the negative effects. He emphasized the goals and content of the newly proposed sustainability guidelines, specifically that all agreements must fulfill three criteria:

1. The agreements must reduce environmental damage (reduce negative externalities);
2. The government has set a goal for this reduction or the agreement helps in complying with a legal requirement;
3. The proposed measure to achieve the reduction is cost-efficient.

[21] Act of 2 July 2019, establishing a framework for the development of policy aimed at reducing irreversibly and progressively the Dutch greenhouse gas emissions in order to limit global warming and climate change, Bulletin of Acts and Decrees 2019, 253. Entry into effect on 1 September 2019, Bulletin of Acts and Decrees 2019, 254.

[22] Supreme Court of the Netherlands, State of the Netherlands v. Urgenda Foundation, ECLI:NL:2019:2006 dated December 20, 2012.

[23] Authority for Consumers and Markets, "Sustainability Agreements. Opportunities with competition law," https://www.acm.nl/sites/default/files/documents/2020-07/sustainability-agreements%5B1%5D.pdf.

[24] Ibid.

[25]Martijn Snoep, "GCR Connect: Sustainability and Cooperation," April 28, 2021. https://www.acm.nl/nl/publicaties/speech-duurzaamheid-en-samenwerking-martijn-snoep-gcr-connect-28-april-2021.

2. 3 France (ARCEP)

Considered a world leader in sustainability, France has approached a multi-layered position to sustainability, including commissioning studies, publishing articles and position papers, and taking legislative actions.

Part of BEREC - The Body of European Regulators for Electronic Communications, telecom regulator of France, ARCEP, the Electronic Communications, Postal and Print media distribution Regulatory Authority is on a mission to promote sustainability in the telecom sector, being a staple in Europe for their approach regarding environmental consciousness. The digital environmental footprint in France is one of ARCEP's area of concerns, commissioning multiple studies on the impact of certain technologies on the environment and dedicating resources to fulfill France goals of achieving carbon neutrality. BEREC even describes ARCEP as one of the pioneering telecoms regulators in terms of digital sustainability.

As part of their long-term plan and to prove their mission in ensuring sustainability in the telecom sector, ARCEP started a cycle of reflection in September 2018 with a 5- to 10-year time horizon to forecast network evolution. The goal is to anticipate the difficulties that may arise in the regulation of exchange networks and to plan ahead accordingly. ARCEP has assembled a Scientific Committee made up of 10 experts representing various fields of knowledge from the academic, business, and industrial worlds to carry out this task.[26] In 2019, as part of the same strategy, in the context of a multi-player cycle of thoughts entitled "Future networks", ARCEP issued a study addressing the environmental impact of digital technology.[27]

In August 2020, the Ministry for the Ecological Transition and the Ministry for the Economy, Finance and the Recovery assigned ADEME and ARCEP with a joint 18-month task, to measure the digital environmental footprint in France and identify levers of action and best practices to reduce the carbon footprint. In order to meet the 2030 and 2050 environmental targets of the European Commission, which the French Government takes very seriously, they have tasked ARCEP with measuring the digital environmental print.

As a result, ARCEP published a report[28], an environmental impact assessment of the digital sector in France and courses of action to be taken. The key courses of action identified by ARCEP relate to:

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[26] ARCEP, Future networks, "Digital tech's carbon footprint: Arcep publishes a new brief as part of its reflection process on future networks," October 23, 2019. https://en.arcep.fr/news/press-releases/view/n/future-networks-3.html.

[27] ARCEP, "Réseaux du futur - Note n° 5 - L'empreinte carbone du numérique," October 21, 2019. https://www.arcep.fr/uploads/tx_gspublication/reseaux-du-futur-empreinte-carbone-numerique-juillet2019.pdf.

[28] Yasmine Aiouch (Deloitte), Augustin Chanoine (Deloitte), Léo Corbet (Deloitte), Pierrick Drapeau (Deloitte), Louis Ollion (Deloitte), Valentine Vigneron (Deloitte), avec les contributions de Caroline Vateau (APL-datacenter), Etienne Lees Perasso (Bureau Veritas), Julie Orgelet (DDemain), Frédéric Bordage (GreenIT.fr) et Prune

- the need for more in-depth knowledge of the impacts, for data collection and paving the way for the creation of public databases on this issue;
- the need for reliable data to fine-tune the modelling of digital's different components;
- the need to take action to curb the environmental footprint of "equipment" and "hardware" (extending the life of digital equipment, repairability, durability, reuse, refurbishing, functional and repair economies) without overlooking the interdependence of networks, data centres and devices;
- the need to involve every stakeholder, in other words:
- the businesses that design digital services, hardware and software, to move towards sustainable design;
- consumers and business users who need to be made more aware of responsible and sober use of digital services.

As an outcome of ARCEP's reports, consultations and sessions involving experts from various fields, the French regulator published a series of recommendations based on ARCEP's findings in the field of digital sustainability: *Strengthening public policymakers' capacity to steer digital technologies environmental footprint, Incorporating environmental issues into ARCEP's regulatory actions* and *Increasing incentives for economic, private and public sector stakeholders as well as consumers.* The findings were also taken into account and transposed in the Digital RoadMap published by the French government in 2021.[29]

The 2021 RoadMap of France aims for responsible digital services and an ecological transition.[30] The roadmap is developed along three lines: *develop knowledge of the digital environmental footprint, support a more sober digital environment* and *make digital technology a lever for the ecological and solidarity transition.* The French executive also plans to address the environmental costs and lifecycles of producing digital equipment, given that the amount of electronic waste in Europe is growing by 2% per year and that less than 40% of it is recycled.

Esquerre (IDATE). 2022. Evaluation de l'impact environnemental du numérique en France et analyse prospective, Etat des lieux et pistes d'actions. https://www.arcep.fr/uploads/tx_gspublication/etude-numerique-environnement-ademe-arcep-volet01_janv2022.pdf.

[29] FRENCH DIGITAL COUNCIL, Roadmap on the environment and digital technology - 50 measures for a national and European agenda on responsible digital, i.e. sober and at the service of the ecological and solidarity transition and sustainable development goals, Press kit of the report submitted to the Minister for the Ecological and Inclusive Transition and the Secretary of State for Digital Affairs, July 2020. Available online at: https://cnnumerique.fr/environnement_numerique.

[30] Digital Roadmap and Environment, April 27, 2022. https://www.ecologie.gouv.fr/feuille-route-numerique-et-environnement.

On November 2, 2021, the French Senate approved Law No. 2021-1485[31] aimed at reducing the environmental footprint of digital technology, creating an obligation for French telecoms operators to disclose to the public what actions they have taken to reduce their carbon footprint. A report[32] commissioned by the French Senate shows that the digital sector could account for 6.7% of greenhouse gases emitted by 2040, currently the percentage being at 2% in 2019.

The report, based on the findings made by the Regional Planning and Sustainable Development Commission was commissioned in order to show the impact of digital technologies on the environment and to serve as a basis for legislative action in order to reduce the impact by enacting responsible policies. The report shows the importance of balancing the environmental gains made possible by digital technology and its direct and quantifiable effects in terms of water use, energy consumption and greenhouse emissions. The report shows important figures and draws attention to the challenges faced by the telecom industry regarding sustainability, calling for action in France to reconcile the digital transition and ecological transition. Reports like this helped to pass the November 2 law which emphasizes several important points, such as increasing knowledge of how digital technology affects the environment and promotes digital sobriety. It also aims to discourage virtuous digital practices by supporting data centers and networks that are more energy-efficient, reducing the amount of energy used, as well as by introducing the idea of software obsolescence in particular. The law requires telecom operators to publish and be transparent about key indicators on their policies to reduce their environmental footprint.

The Bill includes several provisions aimed at making digital users aware of their environmental impact, provisions that limit the renewal of terminals, which are the most responsible for the digital carbon footprint, provisions for migrating to less energy-intensive data centers and networks and rules that promote the development of ecologically friendly digital habits.

France is also taking steps in assessing new technologies and implementing policies that help maintain sustainability. In addition to the "Achieving digital sustainability" (Pour un numérique soutenable) - a joint work of BEREC members including ARCEP on the main issues and ways of action on digital sustainability - platform's work, ARCEP published a study[33] on January 14,

[31] Law n° 2021-1485 of November 15, 2021 published in JO n° 266 of November 16, 2021. http://www.senat.fr/dossier-legislatif/ppl20-027.html.

[32] Information report no. 555 (2019-2020) by MM. Guillaume CHEVROLLIER and Jean-Michel HOULLEGATTE, made on behalf of the commission for regional planning and sustainable development, filed on June 24, 2020. http://www.senat.fr/rap/r19-555/r19-555_mono.html.

[33] Information report no. 555 (2019-2020) by MM. Guillaume CHEVROLLIER and Jean-Michel HOULLEGATTE, made on behalf of the commission for regional planning and sustainable development, filed on June 24, 2020. https://www.arcep.fr/fileadmin/cru-

2022, conducted by mobile technical experts, comparing, with identical data consumption trends, energy consumption and greenhouse gas emissions produced by the current scenario of 4G network deployment and 5G (in the 3.5 GHz band), with that of the "Achieving digital sustainability" European platform. The study's aim is to lead to an understanding of the impact that the introduction of 5G will have on the consumption of energy.

ARCEP is active in ensuring sustainability in the telecom sector even holding workshops, an example being the: "How to integrate the environmental issue into the frequency allocations of the 26 Ghz band (which will host 5G)?" workshop organised in November 2021, their purpose being to discuss and develop ideas that are meant to support the legal framework and to be forwarded to the government with the scope of helping them enact the appropriate policies.

In addition to setting up workgroups, workshops, issuing reports and assessments, providing consultation and awareness all relating to sustainability in the telecom sector, ARCEP is expected to be involved in creating an assessment of the environmental footprint of the audio-visual sector in 2022, issuing recommendations to content service provider and TV broadcasters and creating eco-design guideline together with the audio-visual regulator.

2. 4 Finland (Traficom)

The Finnish government stated that sustainable development is a priority for Finland which was ranked number 1 in 2021 in an annual official ranking made by the UN and the Bertelsmann Foundation, an international sustainable development comparison. This shows that Finland is close to achieving the UN Sustainable Development Goals related to poverty alleviation, health, education, water, energy, reducing inequality, peace, and the rule of law.[34]

Finland is implementing this global Agenda for Sustainable Development by means such as the national Society's Commitment to Sustainable Development which include goals like obtaining a carbon neutral society and a lifestyle respectful of the carrying capacity of nature.[35] By 2030, Finland is confident it will downsize its dependency on imported fossil fuels by 50% and will totally ban the use of coal in power generation. However, there are still challenges

1656326264/user_upload/grands_dossiers/environnement/etude-environnement-4Gvs5G-resume-executif-comite-expert-mobile_janv2022.pdf.

[34] Government Communications DepartmentMinistry for Foreign Affairs, "Finland ranks first in international sustainable development comparison," June 14, 2021. https://valtioneuvosto.fi/en/-//10616/finland-ranks-first-in-international-sustainable-development-comparison.

[35] Prime Minister's Office, "Towards the Finland we want by 2050. The state of sustainable development in 2020 in light of indicators and comparative studies," https://sustainabledevelopment.un.org/content/documents/26264VNR_2020_Annex_2.pdf.

imposed in terms of energy use which could also expand due to the emergence and growth of new technologies in the ICT sector.

As part of its responsibilities, Traficom is responsible for *promoting climate and environment issues and related strategic programmes*. The regulator is also in charge of *coordinating planning and the implementation of the climate and environment issues* as well as *builds, develops and maintains networks dealing with climate and environment issues.*

Focusing on telecom sustainability, Finland's regulator, Traficom, has conducted a series of studies and reports on the assessment of the environmental impact of transport or emerging technologies as well as the interest of consumers into using environmentally friendly technologies. However, the environment section of the publications on the official website is scarce and contains only a few studies, making the activity of Traficom in the field of sustainability quite limited when compared to Finland's leading role in sustainable development.

In 2020, Traficom published a report[36] on the impact of emerging technologies in the ICT sector on the environment and climate change. As a part of the ICT climate and environment strategy carried out by the Finnish Ministry of Transport and Communications, the study focused on examining and mitigating the effects of certain new technologies on climate and environmental change in 2020 and by 2035, and to suggest possible ways to mitigate the negative effects.

A survey report[37] on consumers which shows the consumers' views on environmental impacts of information and communication sectors' devices and services, usage of internet services, replacement intervals of devices, and recycling of devices is also published by the regulator. The study revealed a need for a better understanding of the environmental impact of IT equipment and services in Finland by consumers and it showcased the desire of Finnish consumers to become a more sustainable consumer in the future, if more information is provided. The survey was commissioned as part of a strategy to reduce harmful environmental impacts and guarantee energy efficiency, and is part of a larger effort of Finnish authorities to ensure that the ICT sector, which contributes to a greater deal of emission and energy consumption will prove to be sustainable and will benefit from all the tools needed to ensure its development into an environmentally friendly and limited or neutral in terms of emissions.

[36]Deloitte, "Selvitys ICT - nousevien alan teknologioiden vaikutuksista ympäristön ja ilmastonmuutokseen," 224/2020. https://tieto.traficom.fi/sites/default/files/media/publication/ICT_ilmastovaikutukset_selvitys_Traficom_julkaisuja_244_2020_17.8.20.pdf.

[37]Traficom, "Kuluttajat kiinnostuneita ympäristöystävällisestä netin käytöstä," November 10, 2022. https://www.traficom.fi/sites/default/files/media/publication/Tiivistelma-ymparistokuluttajatutkimus-marraskuu-2020.pdf.

In November 2019, the Ministry of Transportation and Communications established a working group to create a climate and environmental strategy for the ICT sector. The strategy's goal was to create consensus regarding the sector's impact on the environment and offer suggestions for further action. The working group was composed of numerous organizations, including telecom providers, academic institutions, research centers, consumer unions, media companies, environmental groups, and different public sector entities. The final strategy[38] was released in March 2021 and contains a lengthy list of suggestions, including some for government agencies, data centers, and telecom carriers. The goals of the National Strategy for the ICT Sector is to advance environmentally responsible digitalization and aid in the fulfillment of related policies and developments that support achieving the results. As Traficom is also the transport regulator, they also publish studies[39] on the sustainability of the transport sector.

2. 5 Ireland (ComReg)

The Irish Government is committed to the 2030 UN Agenda for Sustainable Development and to fully achieving the Sustainable Development Goals by 2030. The government is actively working on introducing sustainable policies in all aspects of society in order to move to a future that protects the natural resources and environment.[40] Ireland has mobilised all aspects of its society, from government, businesses as well as individuals to work together to achieve the goals imposed by the UN agenda by 2023[41], including its telecom regulator, ComReg.

Ireland's Telecom Regulator, ComReg, is devoted to ensuring sustainability and is taking steps into understanding how the electronic communication industry can reduce its own carbon footprint and how it can change and develop sustainably with the environment. Some measures proposed include tele-working and using videoconferencing to reduce greenhouse gas emission from transportation, to develop IoT technologies that can increase agricultural productivity and energy consumption. ComReg is aware that encouraging the

[38] Ministry of Transport and Communications, "Climate and Environmental Strategy for the ICT Sector," March 9, 2021. https://julkaisut.valtioneuvosto.fi/handle/10024/162912.

[39]Traficom, Heidi Auvinen, Anu Tuominen, Esko Lehtonen ja Fanny Malin, "Kestävän liikkumisen toimien kulkutapavaikutukset", Traficomin tutkimuksia ja selvityksiä Traficoms forskningsrapporter och utredningar Traficom Research Reports 13/2020. https://www.traficom.fi/sites/default/files/media/file/Kest%C3%A4v%C3%A4n_liikkumisen_toimien_kulkutapavaikutukset_Traficom_13_2020.pdf.

[40]Environmental Protection Agency, "Ireland's Environment: Sustainable Economy," https://www.epa.ie/our-services/monitoring--assessment/assessment/irelands-environment/sustainable-economy/.

[41] Government of Ireland, "17 Goals to Transform our World. Highlighting Ireland's progress towards achieving the United Nations Sustainable Development Goals," https://irelandsdg.geohive.ie/.

sector to support a more sustainable and inclusive economy is necessary in order to be in line with the goals, priorities and policies imposed by the European Green Deal.[42]

In its 2021-2023 Strategy Statement[43], ComReg includes sustainability as one of its main goals, acknowledging that the *ECS sector can play an important role in creating a more sustainable economy. The carbon footprint of the sector is changing as new networks get deployed.* In their Strategy, ComReg is described as an organisation that values environmental sustainability. In accordance with industry standards, ComReg has implemented a variety of green initiatives and is committed to reducing the carbon footprint of its offices and operations.

ComReg published a Call for Inputs[44] in 2019 to learn more about the connection between connectivity and decarbonization. Several important projects and commitments in this plan are shaped by the lessons learned from that Call for Inputs. The Connectivity and Decarbonisation call for inputs served as a way to learn more about how the electronic communications industry interacts and affects climate change, including how it can help the economy become decarbonized, how to lower its own carbon footprint, and how to adjust to a changing environment. The report highlighted four ways to reduce emission: transportation (such as traffic optimization), agricultural (such as precision farming and using new technologies), power (such as smart grids), and industrial (such as the use of machine-to-machine (M2M) and Internet of Things).

In 2019, The Irish Government released its "Climate Action Plan 2019"[45] in response to the threat of climate change, which plots a route toward challenging decarbonization goals. The Climate Action Plan emphasizes the significance of government and public bodies acting to achieve Ireland's decarbonization targets and acknowledges that Ireland must scale up its commitments to address climate disruption. ComReg has taken steps towards making sure it supports decarbonization.

In the 400 MHz Award procedure, ComReg allocated radio spectrum rights of use specifically for the supply of Smart Grid, recognizing the critical role of Smart Grid as an enabler in the reduction of Greenhouse Gas ('GHG')

[42] European Commission, "A European Green Deal," https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en.

[43] Commission for Communications Regulation, "Electronic Communications Strategy Statement 2021 to 2023," https://www.comreg.ie/media/2021/12/ComReg-ECS-Strategy-Statement-English-Dec-7-Final-Web.pdf.

[44] Commission for Communications Regulation, "Call For Inputs Connectivity and Decarbonisation," December 20, 2019. https://www.comreg.ie/media/dlm_uploads/2019/12/ComReg-19126.pdf.

[45] Department of the Environment, Climate and Communications; Department of the Taoiseach, "Climate Action Plan 2019," June 17, 2019, last updated June 2, 2022. https://www.gov.ie/en/publication/ccb2e0-the-climate-action-plan-2019/.

emissions.[46] In order to reduce carbon emissions and the effects of climate change, smart grids have been highlighted as a crucial enabler and are included as part of the action plan set by Project Ireland 2040, Ireland's National Strategic Framework that promotes a transition to a low carbon energy future.[47]

As part of their work in the Department of Communications, Climate Action & Environment, ComReg has launched a project[48] on *Climate Change Impact and Adaptation of Electronic Communications Networks in Ireland*, supporting the evaluation of the impact made by the electronic communications sectoron the environment. As part of the project and their strategy, ComReg is interested in ascertaining what can be done to reduce the carbon footprint of the electronic communications industry.

In addition, ComReg is interested in the view of consumers on sustainability in the telecom sector, by launching a 'Confidence and Awareness' consumer survey[49]. The questions addressed were a way to find more about consumer's attitudes and opinions on the environmental impact (such as carbon footprint) and long-term viability of mobile devices manufacturers and service providers.[50] More recently, in April 2022, ComReg held a webinar under the title "Towards a more sustainable Telecommunications ecosystem"[51] which emphasized ComReg's action and devotion to a more sustainable future.

In the upcoming future, ComReg plans a series of initiatives in order to ensure sustainability: they aim to continue to put in place the necessary measures in order to reduce its Carbon Footprint, in line with the government Climate Action Plan and other initiatives and intends to develop a project that will support flexible and remote working which has been found to improve emissions and has an overall positive environmental impact.

2. 6 Hungary (NMHH)

While making significant progress in the field of environment in the last decade, Hungary is still below the EU average on the Eco-Innovation score and their environmental and resource management activities achieve extremely low

[46] Commission for Communications Regulation, "400 MHz Band Spectrum Award," https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/400mhz-band-spectrum/.

[47] Government of Ireland, "Project Ireland 2040 - Building Ireland's Future," https://assets.gov.ie/7335/7692660a70b143cd92b1c65ee892b05c.pdf.

[48] Department of Communications, Climate Action & Environment, Annual Report 2019

[49] ComRegWebinar, "Towards a more sustainable Telecommunications ecosystem," https://www.comreg.ie/media/2022/05/ComReg-2239.pdf p. 8.

[50]Commission for Communications Regulation, "ComReg issues Electronic Communications Sector Quarterly Report for Q4 2021," March 10, 2022. https://www.comreg.ie/comreg-issues-electronic-communications-sector-quarterly-report-for-q4-2021/.

[51] ComRegWebinar, "Towards a more sustainable Telecommunications ecosystem," https://www.comreg.ie/media/2022/05/ComReg-2239.pdf.

results. [52] Hungary still faces significant challenges as they are heavily dependent on fossil fuels, the energy efficiency is low and there is no strong governmental response to environmental decision making. While being committed to the 2030 UN Agenda[53] and stating that *the environmental pillar has always been the centre of the concept of sustainability in the country,* Hungary is far from achieving the environmental goals laid by the Agenda.

While facing financial barriers as a main challenge in implementing their goals, Hungary's government announced the Climate and Environmental Protection Action Plan in 2020.[54] Eight action points are suggested, including waste management, environmentally friendly technologies for businesses, renewable and carbon-neutral energy production, energy efficiency, reforestation based on newborn babies (10 trees/baby), increased access to and use of reasonably priced electric cars, the launch of the green bus program, and the introduction of green government bonds. In addition to these, in 2020, a dedicated climate protection law was introduced in Hungary aiming to decrease the carbon emission of the country by 40% (to the base of 1990).[55] Following that, a National Clean Development Strategy was adopted.[56]

Hungary's telecom regulator, The National Media and Infocommunications Authority (NMHH) however, has not taken any important steps in ensuring the goals for carbon-neutral energy productions and how energy efficiency will be met. The steps taken are limited and only refer to the corporate social responsibility of the regulator itself taking action such as purchasing modern vehicles for their office in order to reduce their footprint.[57]

What could be seen as a way of enquiry about sustainability in the telecom sector, the NMHH has included a question about the importance of sustainability in its 2021 annual survey report[58] to consumers using mobile

[52] European Commission, "Eco-innovation Action Plan: Hungary," https://ec.europa.eu/environment/ecoap/hungary_en.

[53] UN Sustainable Development Goals: Hungary, "Main messages of Hungary," https://sustainabledevelopment.un.org/memberstates/hungary#:~:text=The%20environmental%20pillar%20has%20always,furthering%20sustainable%20development%20and%20peace.

[54] Ministry for Innovation and Technology, "2020. Climate and environmental protection action plan," https://2015-2019.kormany.hu/download/5/07/c1000/Climate%20and%20environmental%20protection%20action%20plan_EN.pdf.

[55] Act of XLIV of 2020 on Climate Protection.

[56] Nemzeti Tiszta Fejlődési Stratégia 2020-2050 (National Clean Development Strategy) https://cdn.kormany.hu/uploads/document/5/54/54e/54e01bf45e08607b21906196f75d836de9d6cc47.pdf .

[57] NMHH, Corporate social responsibility. https://english.nmhh.hu/responsibility-sustainability.

[58] NMHH, "Sustainability is less important when buying mobile devices," February 16, 2022. https://english.nmhh.hu/article/226947/Sustainability_is_less_important_when_buying_mobile_devices.

services. As part of a research aiming to gain a better understanding of the state of the electronic communications sector in Hungary, the survey found that Hungarian consumers do not consider sustainability when using or buying mobile devices and would prefer a device that is cheaper rather to an environmentally friendly device. As a step forward in the right direction, the NMHH also published an article [59]based on the findings of a report on the short lifespan of mobile devices in which they mention it would be *important for consumers to take sustainability into account when using and buying devices.*

NMHH implemented the "Netre fel!"[60] programme which allows the replacement of outdated devices that are unable to connect to the 4G network with a subsidy from the state. Within the scheme, devices handed to retailers are recycled. The programme offers a 20.000 HUF (apx. 50 EUR) support for turning in a 2G or 3G device and switching to a 4G device.

However, no recent reports focus on any sustainability policy and there are few actions taken by the NMHH in the development of new carbon neutral technology, environmental impact of technologies or consumer's sustainability views. The strategic goals imposed by the 2018-2022 NMHH strategy[61] do not refer to sustainability or environmental consciousness.

2. 7 Spain (CNMC)

The Spanish regulator incorporated sustainability at a strategic level by formulating clear objectives in its Strategic Plan (2021-2026)[62] and Action Plan (2021-2022)[63]. In the former, the CNMC vouched to integrate the Sustainable Development Goals (SDGs) in its decision-making process. Thus, its activity will be oriented towards the achievement of the goals of the 2030 Agenda, identifying in the development of its functions the areas of action that contribute to the achievement of these objectives. In particular, promoting and fostering the ecological transition and digitization and fostering competition, which has the potential to drive growth through its impact on productivity and, therefore, stands as a long-term driver of well-being.

In the latter, the CNMC mentioned placing the energy consumer at the center of all the tasks of the CNMC. Thus, on the one hand, promoting the active role of the consumer and guaranteeing access to sustainable energy options; and on the other, trying not to leave anyone behind in the face of the new ecological transition, with adequate consumer protection measures, with

[59] NMHH, "Why is the life of mobiles so short?," January 28, 2022. https://nmhh.hu/cikk/226447/Miert_olyan_rovid_a_mobilok_elete.

[60] NMHH, "Support is already available for 2G devices!," https://netrefel.hu/.

[61] NMHH, NMHH Strategy 2018-2022. https://english.nmhh.hu/document/195890/nmhh_strategy_2018_2022.pdf.

[62] CNMC, Strategic Plan 2021 - 2026, January 22, 2021. https://www.cnmc.es/en/node/386291.

[63] CNMC, Action Plan 2021-2022, in force as of January 22, 2021. https://www.cnmc.es/consultas-publicas/cnmc/plan-actuacion-2021-2022.

special attention to vulnerable consumers, and those consumers with insufficient knowledge of the market, which at the same time could avoid distortions of the market. The CNMC also vouched to encourage through regulation the decarbonization of the economy and renewable energy certification processes. Earlier this year, the Spanish telecom regulator also held a meeting focused on Sustainability.[64]

2. 8 Austria (RTR)

Austria's telecom regulator has not posted any position paper, report or article about sustainability until now. However, Austria's focus on sustainability is reflected on the actions of other institutions: on June 1, 2022, the Austrian Federal Competition Authority published its draft Sustainability Guidelines[65] to provide guidance for assessing ecological/environmental sustainability agreements under the new sustainability exemption recently introduced in Austrian antitrust law[66].

2. 9 Denmark (Danish Business Authority)

The Danish Business Authority, Denmark's telecom regulator, is committed to creating growth in Denmark through a world class ICT-infrastructure. The mission of the Danish Business Authority for the foreseeable future is *to contribute to a responsible and sustainable economic development, in order to improve competitiveness around the country*[67], which is why sustainability has been an integral part in the regulator's strategy in recent years. On its website, the regulator makes available multiple analyses and case studies[68] provided to show the potential in the green transition and circular economy in Denmark.

[64] CNMC, "Ad-hoc virtual DGs Meeting – Sustainability," published January 26, 2022. https://www.cnmc.es/sobre-la-cnmc/actividad-institucional/ad-hoc-virtual-dgs-meeting-26th-january-2022-sustainability.

[65] Federal Competition Authority, "Draft guidelines on the application sustainability-agreements," published June 1, 2022, https://www.bwb.gv.at/en/news/news-2022/detail/afca-publishes-draft-guidelines-on-the-application-sustainability-agreements-asking-for-comments.

[66] Viktoria H. S. E. Robertson, "The New Sustainability Exemption in Austrian Competition Law," *Journal of European Competition Law & Practice (Forthcoming)*, October 29, 2021. https://ssrn.com/abstract=3957551 or http://dx.doi.org/10.2139/ssrn.3957551.

[67] Danish Business Authority, "Mission and Vision," https://danishbusinessauthority.dk/mission-and-vision.

[68] Danish Business Authority, "Green transition and circular economy," https://danishbusinessauthority.dk/green-transition-and-circular-economy.

2. 10 United States (The National Telecommunications and Information Administration, Federal Trade Commission)

In 2018, the National Telecommunications and Information Administration requested comments regarding the development of a long, comprehensive national spectrum strategy[69]. This came after a Presidential Memorandum, *Developing a Sustainable Spectrum Strategy for America's Future,* was issued and demanded recommendations to:

- Increase spectrum access for all users, including on a shared basis, through transparency of spectrum use and improved cooperation and collaboration between Federal and non-Federal spectrum stakeholders;

- Create flexible models for spectrum management, including standards, incentives, and enforcement mechanisms that promote efficient and effective spectrum use, including flexible-use spectrum licenses, while accounting for critical safety and security concerns;

- Use ongoing research, development, testing, and evaluation [RDT&E] to develop advanced technologies, innovative spectrum utilization methods, and spectrum sharing tools and techniques that increase spectrum access, efficiency, and effectiveness;

- Build a secure, automated capability to facilitate assessments of spectrum use and expedite coordination of shared access among Federal and non-Federal spectrum stakeholders;

- Improve the global competitiveness of United States terrestrial and space-related industries and augment the mission capabilities of Federal entities through spectrum policies, domestic regulations, and leadership in international forums[70].

Furthermore, in 2019 the Assistant Secretary of Commerce for Communications and Information released a statement that the Institute for Telecommunication Sciences (ITS) was conducting tests of two innovative technologies, the SAS (spectrum access systems) and ESC (environmental sensing capability sensors). The ESC sensors are designed to alert the associated spectrum access systems when Federal radar systems are operating in the band, so that the SAS can take immediate action to prevent interference[71].

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[69] National Telecommunications and Information Administration, "Developing a Sustainable Spectrum Strategy for America's Future," *Federal Register* 83, no. 245, December 21,2018. https://www.ntia.doc.gov/files/ntia/publications/2018-27690_3.pdf.

[70] Memorandum for the Heads of Executive Departments and Agencies, *Developing a Sustainable Spectrum Strategy for America's Future*, 83 FR 54513, Oct. 30, 2018. https://www.gpo.gov/fdsys/pkg/FR-2018-10-30/pdf/ 2018-23839.pdf.

[71] National Telecommunications and Information Administration, "Remarks of Assistant Secretary Redl at the Free State Foundation 11th Annual Telecom Policy Conference," March 26, 2019. https://www.ntia.doc.gov/speechtestimony/2019/remarks-assistant-secretary-redl-free-state-foundation-11th-annual-telecom.

Later in 2020, a Report on the Presidential Memorandum on Developing a Sustainable Spectrum Strategy for America's Future[72] was issued. The purpose of the report was to weigh if the US was optimized for a new implementation of a spectrum strategy and whether or not a new structure was needed. The report did not raise serious issues, rather it emphasized a series of changes in the agency and its structure.

At the beginning of 2021 the second annual report on the status of spectrum repurposing came out. The focus remained on repurposing mid-band spectrum[73] in order to support commercial wireless services and the conclusion reached was that great progress had been made. However, no concrete actions have yet been taken to prioritize sustainability in telecommunications.

Nevertheless, the Federal Trade Commission (FTC) has adopted sustainability as a principle that governs all its operations, which is reflected in the existence of Green Guides, which apply to all industries in which FTC operates. They are *designed to help marketers avoid making environmental claims that mislead consumers.* The Green Guides were first issued in 1992 and were last revised in 2012 and provide guidance which includes: *1) general principles that apply to all environmental marketing claims; 2) how consumers are likely to interpret particular claims and how marketers can substantiate these claims;* and *3) how marketers can qualify their claims to avoid deceiving consumers.*

The most recent update of the Guides is designed to make them easier for companies to understand and use. The changes include new guidance on marketers' use of product certifications and seals of approval, claims about materials and energy sources that are "renewable," and "carbon offset" claims[74].

Surprisingly, the Federal Communications Commission (FCC) mainly responsible for overseeing the telecommunications sector has not yet dealt with the topic of environmental sustainability in its policymaking.

2. 11 India (TRAI)

In India, the most relevant and recent approach to sustainability was released in 2017, as *Recommendations on Approach towards Sustainable Telecommunications*[75]. In this report, the main focus was on calculating the

[72] Report on the Presidential Memorandum on Developing a Sustainable Spectrum Strategy for America's Future: Governance, April 22, 2020. https://www.ntia.gov/files/ntia/publications/csmac_sc1_presentation_april_22_2020.pdf

[73] National Telecommunications and Information Administration, "Second Annual Report on the Status of Spectrum Repurposing," December 2020. https://www.ntia.doc.gov/files/ntia/publications/second_annual_ntia_spectrum_repurposing_report.pdf, 3.

[74] FTC, "Environmentally Friendly Products: FTC's Green Guides," https://www.ftc.gov/legal-library/browse/federal-register-notices/guides-use-environmental-marketing-claims-green-guides

[75] Telecom Regulatory Authority of India, "Recommendations on Approach towards Sustainable Telecommunications," October 23, 2017.

carbon footprint in order to reduce it and achieve the objectives of Green Telecom[76], an initiative raised to resolve some issues faced by India, especially in the rural part, where grid power is not available everywhere or it is located very far away.

However, the report showed that at the time, none of the renewable technology could be specifically recommended for implementation across the networks, but there were a few technologies of storage devices which could store energy for a longer duration, resulting in less dependency on diesel generators, such as Lithium Ion Batteries[77].

In the end, the methods for reducing the carbon footprint were listed as:

- In new mobile tower installations, the backup power to grid shall be based on Energy Efficient solutions/ RET power to the extent feasible such as to make the site diesel free.

- In urban areas, the outdoor BTS installations should be made diesel free to the extent feasible with required capacity of efficient storage battery backup and RET systems.

- The Non-EB (Non- Electricity Board) sites & the sites having grid power availability up to 8 hours and DG set more than 5 years old may be converted to RET.

- Use of outdoor DAS (Distributed Antenna Systems) in uncovered, isolated, scattered and small locations including buildings.

- Active sharing of network infrastructure, which involves the sharing of antenna systems, backhaul transmission systems and base station equipment.

- Adoption of cluster based, long term agreements indexed to Total Cost of Operation (TCO) wherever implementation of RET is through Renewable Energy Service Companies (RESCOs) or power management companies to make the RET adoption sustainable.

The point made by the stakeholders giving these recommendations was that the primary focus of the Green Telecom policy should be reduction in carbon footprint, as opposed to the direction issued by DoT in 2012 stating that 75% of rural towers and 33% of urban towers should be hybrid powered by 2020.

One of the biggest points of interest concerned the recommendation that the service providers would adopt a Voluntary Code of Practice encompassing energy efficient Network Planning, infra-sharing, deployment of energy efficient technologies and adoption of Renewable Energy Technology (RET), which would be submitted to TRAI within three months from the date of issue of the direction.

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https://trai.gov.in/sites/default/files/Recommendation_Green_telecommunication_2310 2017.pdf.

[76] Government of India, Department of Telecommunications, "Green Telecom," https://dot.gov.in/green-telecom.

[77] Government of India, Department of Telecommunications, "Approach towards Sustainable Telecommunications," January 2019. https://dot.gov.in/sites/default/files/Sustainable%20Tekecommunications_1.pdf?download=1, 2.44.

Another direction was that the service providers should evolve a „Carbon Credit Policy" having as ultimate objective the achievement of maximum 50% over the carbon footprint levels of the base year in rural areas and of 66% by 2020. TRAI made recommendations on this policy in April 2011 and no other comments were made. The last recommendation made by the Authority was that service providers should set the target for reduction in Carbon Emission to 30% by 2019-2020 (base year 2011-2012) and by 40% by the year 2022-2023.

Later, in 2019, the *Approach towards Sustainable Telecommunications*[78] was issued. The Government of India assessed the recommendations and agreed to them, suppressing the previously applicable framework.

3. Comparative summary of sustainability measures

Country/ Criterion	Sustainability policy or action launched (if yes, which year)	Partnerships with peer institutions	Public consultation launched	National metrics proposed/under construction	Cooperation with industry members (joint working groups, etc.)	Own sustainability measures of the regulator implemented
UK	YES – 2021			YES		YES
France	YES – 2021	YES		YES	YES	YES
Finland	YES		YES	YES	YES	
Ireland	YES – 2021	YES		YES		
Hungary	YES		YES		YES	
Spain	YES – 2021	YES	YES	YES		
Austria				YES		
Denmark	YES				YES	
US			YES	YES	YES	YES
India			YES	YES		YES

Dedicated regulatory action	Public awareness	Data collection
UK	YES	
France	YES	YES
Finland	YES	YES
Ireland	YES	
Hungary	YES	
Spain	YES	YES
Austria		
Denmark	YES	
US	YES	YES
India	YES	

[78] Ibid.

4. Conclusions

Although the environmental sustainability regulatory and policy practices and actions of telecoms regulatory authorities are recent, there are several available tools that can be used for effective action by regulators aiming to introduce green policies.

To this end, it would be worthwhile to choose a regulatory policy direction (and, if possible, a measurement methodology) that is aligned with the environmental sustainability of the sector (through taking best practices into account. Since ARCEP of Franceis explicitly at the forefront of sustainability initiatives, its activities could serve as a model for any regulator. It should also be remembered that industry players are much further ahead in understanding environmental sustainability challenges on which they must build. In addition, particular attention needs to be paid to raising consumer awareness, based on international examples (and the image of a national regulator committed to green transformation can send a positive message to consumers anyway).

It would be at least as important not only to follow and necessarily replicate other countries' processes with a phased lag, but also to go a little further and take local action. This could be, for example, organising a dedicated industry consultation or workshop on environmental sustainability issues; setting up an expert working group to assist the telecoms regulatory authority in its work; developing partnerships with relevant peer institutions; integrating sustainability considerations into policy and regulatory strategy, spectrum management, licensing processes and data collection; assessing the environmental status of domestic networks and services; commissioning studies; launching consumer awareness programmes and actions as highlighted above; and exploring related regulatory instruments and legislative options or needs (either at statutory or regulatory level). In any case, a general principle of sustainability must apply here too: if everyone does just a little for the future, we can make a significant impact. We hope to see more and more such minor steps in the regulatory and industry actions of the electronic communications sector. We may be just in time.