BEREC Report on the outcome of the public consultation on the draft BEREC Report on ICT sustainability for end-users

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I. INTRODUCTION

During its 57th plenary meeting (from 6th to 8th December 2023), the BEREC Board of Regulators approved the Draft BEREC Report on ICT sustainability for end-users: Empowering end-users through environmental transparency on digital products for public consultation.

BEREC considers awareness of environmental issues as critical for end-users' empowerment and for ICT sustainability. Environmental information on digital products and services could enlighten user choices in terms of their digital consumption. Complementary to effects on the demand side, this data-driven approach of end-users' empowerment could create positive incentives for digital players to support the deployment of greener digital solutions and limit the risk of greenwashing on digital markets.

In 2023, BEREC lead a fact-finding process to raise NRAs' knowledge of existing work and analysis of environmental transparency on ICT sustainability products and end-users' empowerment. This work took the form of a review of literature and existing EU regulation, a workshop on end-users' empowerment and ICT sustainability with representatives of the Commission, consulting firms, BEUC and the European Environmental Bureau (EEB), and an internal questionnaire on NRAs' and other relevant stakeholders' initiatives.

Main results of this work are presented in the Draft Report.

The Draft Report consists of 5 chapters:

- Introduction of the topic within the context of BEREC work on environmental sustainability and on end-users empowerment;

- Presentation of the key concepts on empowering end-users through digital products' information based on the currently valid and newly proposed EU legislation and latest research by public bodies (especially the European Commission) and other entities;

- Summary of the main results of the workshop held in cooperation with the European Commission, experts from Resilio and Ramboll, BEUC and EEB;

- Analysis of the responses provided by member NRAs on the activities and initiatives thereof, of OCAs and third parties (NGOs and industry);

- Conclusions and potential areas for future work.

Following the approval of the Draft Report, a public consultation was launched. In accordance with BEREC's policy on public consultations (PCs), all stakeholders were invited to submit their inputs via EU survey portal by 12 February 2024 (17:00 CET).

The following PC Report summarises the responses received to the public consultation and presents BEREC's position with regard to suggestions and proposals put forward in those responses, as relevant.

In total 5 responses were received, none of them were indicated as confidential.

The contributions were received from the following organisations: ECTA, The Shift Project, The Motion Picture Association (MPA), Resilio and the University of Oulu (Finland).

BEREC welcomes all contributions and thanks all stakeholders for their submissions. Contributions received from stakeholders will be published on the BEREC website, taking into account requests for confidentiality and publication of personal data.

Generally, in their responses, the stakeholders acknowledged the overall significance and timing of the work done by BEREC in order to help identify the current status and future initiatives in the field of end-users empowerment and assess some of the main challenges to increase environmental transparency in the ICT sector.

Stakeholders, namely ECTA and the University of Oulu (Finland) welcomed BEREC's attention to the topic of empowering end-users and assessing some of the main challenges to increase environmental transparency in the ICT sector. Respondents also expressed appreciation for the opportunity to submit their views and additional insights through the public consultation and their willingness to engage further and share their expertise with BEREC in order to build the common industry knowledge.

BEREC appreciates the active feedback received from its stakeholders and is determined to continue working on the subject matter while building transparency and engagement which will benefit the ICT sector and society as a whole.

II.   CHAPTER 1: Introduction

ECTA welcomes the Draft BEREC Report and the related public consultation. It appreciates that BEREC's Draft Report usefully confirms that the efforts of the ICT industry are essential for end-users' empowerment and environmental transparency on digital products. According to ECTA, the Draft Report also provides a useful benchmark of initiatives supporting the empowerment of end-users carried out by the NRAs, various public authorities and third parties in different European countries. Finally, it proposes some recommendations on the role of telecom regulators in promoting environmental transparency. The response states that ECTA's members have been particularly proactive in combating climate change and several of them have played an "avant-garde" role in empowering end-users through environmental transparency on digital products. ECTA is therefore happy to provide substantial comments to the Draft BEREC Report below and is eager to contribute more to the actions undertaken by BEREC.

The University of Oulu thanks BEREC for the opportunity to provide feedback on the recent sustainability work. The University of Oulu finds the work of BEREC addressing the environmental transparency of digital products and services to be very important and timely. The topic of empowering end-users is a very important to be considered, covering also the end-users as active producers and developers. The University notes that the title of the Draft

Report limits the scope to "digital products". It points out that when it comes to the information and communication technologies (ICTs), digital services are equally important as digital products and the contents of the Draft Report also consider digital services. Therefore, the University suggests to consider updating the title to include both "digital products and services".

The University also notes that in the last paragraph of Chapter 1: Introduction, it is stated that "BEREC aims to adopt a holistic approach to the issues related to ICT sustainability." This holistic approach in the Draft Report is said to consider the perspectives of a) networks, data centres, devices, digital services and ways, b) the entire life cycle of digital products, c) relevant environmental impacts including greenhouse gas emissions, energy consumption and abiotic resources used (mineral/metal), and d) different markets. According to the University, such holistic approach lacks a thorough treatment of the computing infrastructure, whose role keeps increasing. Therefore, the University believed that it would be important to consider the role of the computing infrastructure as well. The presented holistic approach primarily considers the environmental footprint of digital services and products. The University of Oulu believes dimensions for a holistic sustainability approach in the on-going ICT sustainability considerations include 1) footprint and handprint dimensions, and 2) environmental, social and economic sustainability perspectives, and calls BEREC to work on all these different dimensions.

The Shift Project brings BEREC's attention to the fact that in 2019, about 3.5% of global carbon emissions were caused by the production and use of digital technology. With a projected increase which is standing at 6% per year, this figure could more than double by 2030 to reach 8% of all global carbon emissions. The electricity consumption of mobile networks has been growing at 10% per year and this rate could surge to 20% per year with the densification of antennas resulting from the usage of higher frequencies together with unchanged geographical coverage requirements. The transformation of the cloud into core cloud and multiple layers of edge cloud (regional, local, micro) together with the increase of unitary processor consumption accelerated by the development and dissemination of generative AI is likely to cause the electricity consumption of data centres to grow at 10% to 15% per year instead of the current 5% to 6% rate. The Shift Project warns BEREC that this will happen unless there will be a digital reset of technical architecture choices, economic models, regulatory frameworks, system design principles and even societal hierarchy of digital uses.

The Shift Project believes that improving transparency of end-users regarding the environmental footprint of their digital services could raise awareness and promote best practices in terms of using digital services, but the stakeholder also thinks that this alone is not enough to encourage behavioural changes. Therefore, a labelling scheme or Eco-design framework is needed for digital services (as for devices): automatically adapt video resolution based on device used, clear guidelines on most efficient codecs reducing network bandwidth, provide a "data saving mode" automatically activated , "audio-only" button on video platforms, prohibition of auto-play without interaction with the user.

Moreover, the Shift Project thinks that transparency is key to ensure arbitration of the common resources so that the society stays resilient. All stakeholders and IT consumers deserve to

have more direct environmental transparency in the IT services they use. Finally, the Shift Project believes that arbitration capabilities shall be designed in order to offer the choice of which systems need to be prioritised under various short- and long-term stress situations.

The Motion Picture Association (MPA) welcomes the progress made in environmental and consumer protection regulations in Europe, as noted by BEREC in this Draft Report, and supports the importance of empowering end-users to make environmentally sustainable decisions. MPA would like to bring for BEREC's consideration a number of points and research findings in the context of empowering end-users through environmental transparency, in particular in relation to promoting sustainable digital services and initiatives to develop greener end-users' digital services.

MPA states that its member companies, and other stakeholders across the AV sector, are among the leaders when it comes to sustainability efforts, innovating at a technical and process level to reduce the environmental impact of content and distribution. MPA believes that consumption of cultural content is not a meaningful carbon intensive activity, and therefore should not be unjustly singled out.

The stakeholder argues that current evidence shows that increased traffic itself does not lead to a significant increase of resource consumption, and while data traffic has increased over the past years, emissions are falling. Content is delivered efficiently, with the help of significant investments in CDNs and compression technology. MPA thinks that recommendations to reduce traffic with the goal of reducing emissions are not grounded in fact.

MPA mentions that most energy use and embedded emissions from content consumption happens at the device level. As a result, it believes corporate-sustainability initiatives, complemented by the EU's CSRD, the upcoming CSDDD and consumer-focused initiatives such as the empowering consumers for the green transition directive, will help empower consumers and enable them to make sustainability conscious choices. MPA communicates that its members contribute to extending devices' lifespan through compatibility efforts of their applications and codecs.

BEREC thanks stakeholders for their overall positive feedback on its new draft BEREC Report on ICT sustainability for end-users: Empowering end-users through environmental transparency on digital products. The focus of this report is to analyse the means to increase ICT-related environmental transparency towards end-users, in order to enable their contribution to the green transition. It should be noted that this workstream is part of a larger body of work by BEREC on the environmental footprint of the ICT sector, including the promotion of environmental accountability of companies – which is essential to accelerate the digital sector's green transition.

BEREC recalls that this work encompasses not only material product (devices, equipment infrastructures), but also immaterial products (meaning digital services).

As highlighted in its other previous publications, BEREC is convinced that digital technologies could be a lever to support the decarbonisation of sectors of the economy. The work of European Green Digital Coalition and ITU that BEREC follows closely, will lead to

better understand this potential enabling role of digital technologies in achieving the ecological transition. At the same time, these technologies also have an environmental footprint (carbon emissions, energy consumption, raw materials depletion, etc) that must be minimised in line with EU's and international environmental targets. The economic and social aspects of end-user's empowerment within digital markets are tackled by other workstreams of BEREC, for instance related to the digital divide or the affordability of electronic communications services.

The empowerment of end-users and transparency are part of the levers to promote the development of sustainable solutions on the markets. This specific report focuses on end-user devices and digital services. It notes the different stakeholder's analysis of digital services environmental impact and ways to mitigate it. It should be reminded that there is no linear correlation between data traffic and energy consumption of networks and that energy efficiency gains of infrastructures have limited the growth of infrastructures environmental footprint in a context of increasing data demand. However, the consumption of digital services relied on the consumption of resources (including energy consumption) and there are important interlinks between this variable and the consumption of devices and digital infrastructures footprint. It is thus important to work towards accountability of all digital players to minimise their environmental footprint. In this report and its past work, BEREC promotes eco-design as interesting lever to reconcile the growth of digital consumption with environmental targets. Stronger awareness of end-users on the environmental impacts of their digital products could also enable to optimise digital consumption and counterbalance attention-grabbing technics developed by some content and applications providers.

To end, BEREC reiterates its availability to keep exchanging with stakeholders, including on their most recent work on environmental sustainability.

III. CHAPTER 2: Key concepts on empowering end-users through environmental information on digital products

University of Oulu believes that Chapter 2 on Key concepts presents very important information about the regulatory developments around ICT sustainability in Europe. The University suggests that it would be helpful to provide clear explanations for the introduced terms as it would essentially act as guidelines for the entire community to work on the ICT sustainability topics. The University stresses that a glossary of the terminology used in the Draft Report would be very helpful as an annex, similar to the two previous BEREC Reports on sustainability.

Resilio notes that in Chapter 2, section 2.1.2, the mentioned initiatives like the Ecodesign for Sustainable Products Regulation (ESPR), the Green Claims, DPP or the EU Ecolabels do not necessarily include the environmental impacts under the PEF method. However, Resilio believes that this should be of capital importance as stated in section 2.1.1. The market will be driven by environmental criteria when the available data is coherent, comparable and relies on serious metrics.

Resilio also points out that in the Focus on Key Concepts #2: OBSOLESCENCE, the Repairability Scoring System (RSS) for laptops or the Ecodesign Regulation for smartphones do not include "functional obsolescence" with operating system compatibility. Resilio suggests that when stating: "by providing versions of the service available on old devices, incorporating carbon footprint calculators in the user interface of the service", BEREC could try to push towards multi-criteria, and not only carbon calculators, thus more closely aligning with Product Environmental Footprint (PEF) methodology.

The Shift Project argues that network compatibility can be a concern in terms of durability because it could have an impact on the lifespan of end-users' devices. Moreover, according to the Shift Project, the assessment of environmental relevance and overall climate impact of technological choices should be systematic. This is particularly relevant when it comes to defining the technical and business implementation of infrastructures such as the New Generation network which have a leverage effect on the overall digital system.

The Shift Project agrees that transparency is the key word to enable all digital actors to make the right choices regarding the sober use of digital technology. The Shift Project outlines that transparency takes the form of provision of data and indicators relating to the environmental impact of digital technology on all the links in the chain consisting of data centres, networks and terminal equipment. They argue that such data must be derived from standardised and recognised calculation methods for each sub-part but then grouped by user service.

The Shift Project believes that data relating to each sub-set (application on the terminal, types of networks used, volume and time spent in the data centres) should be available to show the difference between a fibre or Wi-Fi connection and a 4G or 5G connection, the difference between eco-designed or non-eco-designed applications and the impact of an optimised or non-optimised data centre. The Shift Project underlines that it is thanks to all this data made available by the various players that frugal use of digital technology will be possible and it is thanks to this that objective information can be delivered to users and that new habits can be promoted.

The Shift Project notes that in order to maximise their ability to attract users and develop user engagement, CAPs deploy techniques to stimulate, monitor, and analyse the presence of users on their platforms. Such practices rely on an exponential use of digital technology, e.g., video content, higher quality video standards, algorithms, and artificial intelligence: a handful set of CAPs is then responsible for 75% of the growth of the internet traffic.[1] According to the Shift Project, this exponential rise of digital affluence is not self-regulated as CAPs only bear part of the resulting financial (actual costs of using networks and end-user devices) or environmental (Scope 3 downstream GHG emissions) costs. The Shift Project argues that due to their financial power, a few CAPs drive the market behaviours. Making them accountable could result in reducing the traffic growth by 10 points and prevent the network environmental footprint from growing, reduce the growth of the data centre footprint, save 500/1000 TWh of electricity worldwide in 2030 against the current trend.

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[1] (For additional information see TRANSITIONING TOWARDS SUSTAINABLE DIGITAL BUSINESS MODELS at https://digitalization-for-sustainability.com/publications/).

In relation to the scope of the Draft Report, ECTA appreciates the accent put on the eco-design issue not only with respect to the digital products but also to the digital services.

ECTA deems essential to implement eco-design for electronic communications networks, services, and products (ECNS), and, with no lesser attention, for all providers of internet content, applications and services (CAPs), as well as in relation to cloud computing and related activities. This involves promoting and incentivising the integration of environmental characteristics into product and service design with a view to improving the product's environmental performance throughout its life cycle. When it comes to promoting sustainable digital services, ECTA notes that the analyses of impact of standard digital services reported by BEREC does not cover the Scope 3 emissions.

ECTA acknowledges that Scope 3 emissions measurement is challenging and that the indicators measuring the Scope 3 emissions all have standardisation gaps. ECTA is also aware that those emissions as well as their measurement mostly are beyond the control of ECNS operators. However, the subject is evolving, and BEREC is best placed to follow those updates and to reflect them in its reports.

ECTA therefore respectfully invites BEREC to continue its focus on the specific issue of eco-design in general, and not to single out ECNS, but instead ensuring that there is no lesser attention to the roles of device manufacturers, all CAPs, and all cloud computing and related providers, and to perform follow-up studies focused on it by also collecting the Member States' best practices.

Motion Picture Association (MPA) agrees increased data traffic does not necessarily result in a correlated increase in energy consumption. They note that it is noted in Section 2.3 of the Draft Report, where it is stated that there is no linear correlation between data traffic and energy consumption. This is also recognised by BEREC in its submission to the Commission's consultation on the future of electronic communications sector and its infrastructure (BEREC (2023), 'Response to the Exploratory Consultation', page 4, where it states that while sustainably designed digital services and the deployment of greener infrastructures could help to achieve environmental targets, data traffic alone is not the appropriate indicator to monitor such efforts.

According to MPA, though data traffic has grown over the past years, the emissions association with network transmissions is falling, due to both changes in technology and increased use of renewable electricity (Carbon Trust (2021), 'Carbon impact of video streaming', page 28). Through various forms of investments in the internet ecosystem, such as investment in CDNs, encoding and compression technology, MPA members contribute to these developments by ensuring content is delivered to the end user as efficiently as possible. In relation to the recommendation included on page 18 of the Draft Report for reducing energy consumption is to decrease video resolution, MPA indicates that it would be also important to note that adjusting picture resolution over fixed networks makes a negligible difference in carbon emissions.

MPA argues that approaches seeking to reduce data traffic in relation to the audio-visual content consumption, particularly considering sustainability efforts by the various industry

players. Consequently, they believe that recommendations such as "reducing the consumption of video/streaming" will have a negative impact on the cultural industry, with no proven impact.

To help empower end-users to make green choices while using digital services, MPA thinks it is therefore important to focus efforts on the parts of the value chain that have the most impact. They mention that end-users' devices are the largest contributing component to the energy and carbon impact of an hour of video streaming and make up more than half of the carbon emissions from streaming (Carbon Trust (2021), 'Carbon impact of video streaming', page 52). The stakeholder believes that BEREC's recommendations should therefore be to encourage eco-design of end user devices, and prolonging devices usable life.

MPA believe that additional usage of culture consumption and streaming does not meaningfully deteriorate terminal devices. MPA writes that its members and other online video streaming companies contribute to the extended life of end users' devices, by ensuring the compatibility of their apps, content (codecs) and services with a wide range of devices.

In this chapter, BEREC presents key concepts on empowering end-users through environmental information on digital products.

BEREC thanks for acknowledging that this chapter presents very important information about the regulatory developments around ICT sustainability in Europe. BEREC takes up the recommendation to include a glossary to provide clear explanations for the used terms.

BEREC agrees that transparency is the key concept to enable all digital actors to make the right choices regarding the sustainable use of digital technology. This includes data and indicators relating to the environmental impact of digital technology on all relevant parts, i.e. data centres, networks and terminal equipment. BEREC recalls that it is necessary to consider the entire lifecycle of digital technology, using a multi-criteria, multi-component and multi-stage approach (using the PEF method). It is important to show differences in terms of environmental footprint which may be impacting consumer choices, i.e. between a fibre connection and mobile network connection, between eco-designed or non-eco-designed applications or an optimised or non-optimised data centre.

BEREC agrees with the argument that network compatibility can be a concern in terms of durability because it could have an impact on the lifespan of end-users' devices.

BEREC agrees that all digital services rely on digital infrastructure and devices that generate multiple environmental impacts. As highlighted in BEREC previous work[2] on sustainability, it is key to accurately assess the environmental impacts of digital technologies through robust data collection and sustainability indicators. BEREC also reminds that there is a strong

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[2] Relevant previous work from BEREC on environmental sustainability:
* BEREC Report on Sustainability: Assessing BEREC's contribution to limiting the impact of the digital sector on the environment (2022) https://www.berec.europa.eu/system/files/2022-07/10282-berec-report-on-sustainability-assessing_0_3.pdf
* BEREC Report on Sustainability Indicators for Electronic Communications Networks and Services (2023) https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-sustainability-indicators-for-electronic-communications-networks-and-services.pdf

interdependency between devices, data centres and infrastructures. BEREC also recalls a statement of its report highlighting that there is no linear correlation between data traffic and energy consumption of infrastructures. It reiterates that newer and more energy-efficient technologies and equipment can limit the increase of energy consumption of digital infrastructures and associated GHG emissions particularly for fixed networks. It is also recognised that projected increase of data traffic, and emerging technologies, new digital uses, new services and devices as well as potential rebound effects might have further impact on the energy consumption and associated footprint of networks in the long run. Furthermore, BEREC recalls that this report is focused on improving the information of end-users regarding the environmental footprint of their digital products (including services) and empowering them to play a greater role in the green transition. This could raise awareness and provide a more holistic view and promote positive patterns of digital uses.

BEREC acknowledges that respondents appreciate that the report covers eco-design issues with regard to digital products. Regarding digital services, it reiterates that there is existing work of the European Commission, especially its recent external study "Assessment of the energy footprint of digital actions and services", covered in the BEREC Report.

Taking up a comment of one respondent that the analysis of impact of standard digital services reported by BEREC does not cover the Scope 3 emissions, BEREC will update the relevant parts of its report. BEREC agrees with the respondent that Scope 3 emissions measurement is challenging also in terms of standardisation and thus will follow up on recent developments and reflect those in the report where relevant.

BEREC agrees that eco-design for all digital players and beyond is necessary to tackle sustainability of the whole value chain as requested by one respondent. As underlined by the Green Deal, digital technologies should minimise their own environmental footprint and apply high green standards, as any other sector of the economy. Policy makers should pay attention to address sustainability issues of the whole value chain, covering electronic communications networks, services, and products (ECNS), providers of internet content, applications and services (CAPs), cloud computing and related activities.

IV. CHAPTER 3: Summary of BEREC Workshop on End-Users' Empowerment through environmental transparency on digital goods and services

Resilio expresses gratitude to the BEREC Sustainability WG for the invitation to speak at the workshop in 2023 and for providing an accurate summary of the discussions in Chapter 3.

ECTA believes that the Draft Report provides a comprehensive overview of relevant EU regulation and key concepts from literature, and effectively describes the inputs provided during the BEREC workshop organised for this purpose with expert consultants collaborating with the European Commission and representatives of environmental and consumer associations.

University of Oulu notes that Chapter 3 presents the findings from a consulting study and a stakeholder workshop with representatives from two consumer and environmental organisations. However, the University points out that the collected data does not include inputs from the research domain. It believes that for a wider engagement of stakeholders, it would be important to include the research community in the regulatory work on ICT sustainability in Europe in the future.

BEREC would like to thank the speakers for its workshop on End-Users empowerment and ICT sustainability which took place on 21 September 2023, i.e. the European Commission representatives and consultants (Resilio and Ramboll), consumer protection association (BEUC) and environmentalist association (EEB).

It notes the positive reactions to the summary of these exchanges that allowed to have a more precise view of the European state-of-play and key issues ahead, intertwining end-users empowerment and environmental sustainability. BEREC is committed to represent various point of views in its work and would make sure to include the widest range of speakers in its next events, depending on the topic, including from the academic community, industry, civil society and other relevant public bodies.

V. CHAPTER 4: Existing national initiatives in the Member States

ECTA notes that the Draft Report does not give any detail with respect to the electronic communications network and services (ECNS) operators' current initiatives on environmental transparency and focuses exclusively on the public authorities' initiatives in terms of regulation. ECTA believes that an appropriate description of the current initiatives undertaken by the ECNS operators on environmental transparency towards end-users would have a twofold effect. First, it would provide a useful data collection and therefore transparency of the ECNS operators' actions for the benefit of public authorities, and secondly it would act as an encouragement for the ECNS operators that are preparing the launch of similar initiatives. ECTA therefore kindly invites BEREC to include in the Final Report the current initiatives and actions by the ECNS operators on environmental transparency, or to perform a follow-up work dedicated to the description of those initiatives and actions.

The University of Oulu notes that Chapter 4 presents a collection of existing national initiatives from the national regulatory authorities, which provides very important and up-to-date information for the community. At the same time, it shows how scattered the developments are in Europe, which calls for future work. Regarding Section 4.3, on Benchmark of third parties' initiatives, there is very little information provided about the research activities around ICT sustainability, which takes place in European and national research projects (e.g., in SNS JU). It would be important to develop new ways of working to include research activities and research findings around ICT sustainability into the work of BEREC.

The University stresses that independent research conducted at academic and other organisations plays an important role in the topic of ICT sustainability, balancing the self-

interests of stakeholders towards the common good. According to the University, in addition to the research domain, significant efforts on the environmental sustainability of the ICT sector take place in standardisation bodies, which are not clearly addressed in the draft report. The expertise within these standardisation bodies is directly relevant to the topics of the draft report and a mechanism is needed to share that knowhow in the future work of BEREC on sustainability.

Resilio informs BEREC that in mid-February 2024, a study on the environmental impact of the internet in France conducted with the major Telecom operators will be published. The checklist will be shared so that other European operators can implement such method. It could be noted that such work could be replicated to other countries without exposing and comparing the environmental impact of different Telecom Operators.

The Shift Project would like to supplement information mentioned under section 4.3. Benchmark of third parties' initiatives, 4.3.1. Non-profit organisations. The Shift Project is a French think tank advocating the shift to a post-carbon economy. As a non-profit organisation committed to serving the general interest through scientific objectivity, it is dedicated to informing and influencing the debate on energy transition in Europe. The exponential development of digital technologies and how this development interacts with decarbonisation objectives is a major component of the carbon transition. The Shift Project invites BEREC to consult its website and reports[3].

In this chapter, BEREC presents initiatives taken by NRAs, other competent authorities as well as third parties (non-profit organisations and the private sector) related to environmental transparency and information available to end-users.

BEREC recalls that the input was collected through an internal questionnaire sent to member NRAs.

Regarding the comment that BEREC should include current initiatives and actions taken by ECNs, in section "4.3.2 Projects led by the private sector", BEREC provides examples of initiatives taken by ECNs, including e.g., a company, which offers mobile subscriptions, tracks CO_2 emissions and has solutions to compensate for these emissions, and an operator who has adopted e-waste management, etc.

As regards the comment that more information should be provided about the research activities around ICT sustainability in European and national research projects, BEREC agrees that the role of academic and related research projects is significant, as acknowledged in other work. For such references were not included in the input received by the respondents, it was not part of the relevant chapter. BEREC shares the view that new ways of engagement and cooperation with academia and other research organisations would be of great value.

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[3] See Lean-ICT-Report_The-Shift-Project_2019.pdf (theshiftproject.org), proposals 2 and 4 in the Conclusions part.

In addition to the research domain, BEREC recognises the need to address more clearly the work of standardisation bodies on environmental sustainability of the ICT sector, however, as stated also above, the initial findings of the report were based on NRAs inputs.

As regards the information provided by stakeholders in relation to studies and specific projects related to ICT environmental impact in France, BEREC encourages stakeholders to continue to engage with BEREC regarding issues/developments related to environmental transparency and information to end-users, in order to take these contributions into account in its future work.

VI.   CHAPTER 5: Conclusions: Summary and future work

ECTA believes that when it comes to the collection and publication of the environmental data by industry players of the digital value chains, including ECNS providers, but also, and in particular, device manufacturers, CAPs and cloud computing and related providers, BEREC and other regulatory authorities, and in general public institutions, should carefully define the role and the possible contribution of the different types of companies to such collection and publication of the data. In fact, different companies active at different levels of the value chain have different know-how and ability to have internally different types of data (i.e. the telecoms operators vs. device manufacturers vs. the "over-the-top" providers, to put it more explicitly) and should not be kept accountable for the data which is neither available to them, nor under their control.

ECTA looks forward, with positive and proactive intent, to the forthcoming initiatives announced by BEREC on environmental sustainability and transparency, such as the forthcoming communication campaign in 2024. A focus on potential best practices, including the extension of the lifespan of devices, as well as the follow up activity on sustainability indicators in the ICT sector, especially for components of the internet ecosystem, are clearly relevant, and will continue to contribute to the BEREC's efforts.

Resilio urges BEREC to consider that other regions (like the US or China) are starting to enter the Green IT field, writing standards and developing their methods. It believes that if BEREC wants the EU methods to become international standards, action should be taken soon with these other bodies to ensure the compatibility of such.

The University of Oulu affirms that the current Draft Report focuses on the footprint of digital products and services, which is a very important topic. It provides important status information and sets the steps for the future work. The University stresses that future work would be needed not only on the footprint of digital products and services but also on their handprint. as well as social and economic perspectives of sustainability.

The University also comments on the stakeholder engagement. Many national and EU level research initiatives address the sustainability of the ICT sector and specifically the environmental sustainability perspective. It sees a need to bring the expert community of researchers and other experts to the table. It is very positive that the BEREC identifies the need to ensure that the information provided to consumers is science-based and actionable.

The University suggests that BEREC could build a bridge between the regulatory domain and the research domain to national-level and EU funded research projects by creating mechanisms for information sharing, requirements collection and joint development of best practices. The University encourages BEREC to invite the research community to provide unbiased research results and also encourage the industry and operators to share their data and methodologies with the research community, to tackle the big ICT sustainability topic as a joint effort.

The Shift Project stresses that transparency is key to define a quantitative target for the European digital sector, notably SBTi targets. The Shift Project strongly suggest BEREC that such a quantitative target for the European ICT sector with ideally sub-targets for the different ICT sectors (device, networks, data centres) should be established in order to facilitate the strategic alignment of digital suppliers.

Motion Picture Association (MPA) stresses some following data and references for BEREC's consideration on the energy consumption of some operators as well as on the environmental footprint of 4k resolution estimated to 1g CO_2e/hour to just over 1g CO_2e/hour according to Carbon Trust (2021), 'Carbon impact of video streaming', page 64.

> BEREC would like to thank stakeholders for their feedback on the report and its conclusions. It acknowledges a certain consensus on the key messages of the draft report and key findings.
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> Indeed, BEREC considers critical for stronger transparency and empowerment of users to work on publishing robust and comprehensible data on the environmental footprint of digital products, as well as on their environmental rights (right to repair, protection against greenwashing). Harmonisation of standards and methodologies for environmental quantification and display is indeed crucial: BEREC is actively monitoring the topic and refers to standardisation bodies which are competent to address some of the issues raised by respondents to the public consultation.
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> BEREC recalls the project of a communication campaign on the environmental footprint of devices, complementing previous work by the European Commission on the environmental footprint of digital services for users. It also acknowledges the interesting proposals raised by stakeholders for future work and invites them to participate in the call for topics for BEREC Work Program 2025, if relevant. Finally, BEREC commits to continue providing its expertise to contribute to the collective effort towards a sustainable digital sector, in support of the EU's green transition.