Body of European Regulators for Electronic Communications

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Summary report on BEREC Sustainability ENG Workshops: Sustainability within the digital sector. What is the role of BEREC?

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Executive Summary

As BEREC aims to include sustainability as a key element in its strategy and annual work programmes, **an expert networking group (ENG) has been established in the first quarter of 2020 for a 2 years period to work on improving BEREC's environmental impact** (internal practices to reduce BEREC's own environmental impact) **and on the issue of the environmental sustainability of the electronic communications sector**. The ENG organised a two-day internal workshop, held on 5-6 October 2020. It aimed at **giving some insights regarding the ICT sector's impact on the environment and how BEREC can support sustainability goals and be aligned with other environmental strategies at national and international levels**. Different public and private stakeholders involved in environmental sustainability work in the sector presented their work in this field and gave BEREC a comprehensive overview in order to expand its knowledge in this regard. **This report presents the discussions during the workshop and does not represent BEREC's opinion.**

In terms of the energy consumption of the ICT sector, the scale of the change happening in the digital environment was highlighted. Over the past two decades **internet traffic rose significantly**, but due to **high efficiency gains** of every new technology generation, this rise only led to a moderate increase in energy consumption. Data centres and electronic communications networks have managed to keep energy consumption levels under control. Although, the situation is changing, and the **efficiency gains are failing to keep track with the rapid growth of the sector.** In fact, new technologies (IoT, machine learning, blockchain) are accelerating the demand and **create a "rebound effect"** with a significant impact on the environment. In this respect, the importance of **focusing on the best available infrastructures and technologies** was stressed. It was said that regulators can help by staying technologically neutral, so that old technology can be replaced, and the most efficient technology can be chosen (e.g. 5G and fibre).

It was also highlighted that a **significant impact of the ICT sector on the environment is coming from consumption of raw materials** (scandium, yttrium, lanthanum, cerium, etc.) which has been significantly underestimated. Moreover, it's important to note that **emissions produced due to end-user devices manufacturing** can be **higher than the emissions needed to use the devices** throughout their entire lifecycle. Furthermore, it was also highlighted that efforts to reduce the environmental footprint of the electronic communications sector itself should not be made at the expense of the *enabling* power that the sector has to offer: that is its potential to enable *other sectors* to reduce their emissions.

An important point is that **there are no standardised data collection and measurement methodologies,** therefore estimates vary when measuring the environmental footprint of data centres and networks. However, **a number of initiatives and best practices were presented** related to the sector's impact on the environment. For instance, the European Commission (EC) has commissioned a study on greening cloud computing and electronic communications services and networks with the aim to identify indicators, methodologies and standards for data centres and networks. The Commission's Joint Research Centre (JRC) presented the

EMAS[1] Sectoral reference document for the telecommunications and ICT sector which provides a set of 'Best Environmental Management Practices' (BEMP) that have been developed to minimise environmental impact of public and private companies/organisations. A multi-stakeholder platform of GeSI[2] unites public and private actors of the ICT sector in order to foster partnerships reconciling digital technology with sustainability toward the reach of Sustainable Development Goals (SDGs).[3]

It was suggested that **the role of the regulators could be to stimulate this dynamic by promoting sustainability as a new parameter for competition.**

Day 1: The science behind assessing the environmental impact of the digital sector and the political landscape

1. Understanding the issue and political agenda, DG CONNECT, Ilias Iakovidis and Nikolaos Dendramis, Juan Arregui Mc Gullion

Mr Iakovidis stressed two main points:

- More **attention should be paid to the unsustainable raw material consumption** and the emissions resulting from the production of devices and ICT equipment such as 5G stations, towers, fiber, copper, etc. The amount of emissions due to the production of smartphone, tablets, laptops, desktops, IoT devices might be larger than emissions from their use over average lifetime. For example, the carbon footprint of the use of a smartphone has been reported at the level of15% of its total footprint. In addition, non-circularity of consumer and industrial devices and equipment leads to the fastest rising category of waste: the e-waste.

- Second, the **enabling role of the sector is critical**. Efforts to reduce the environmental footprint of the telecoms sector itself should not be made at the expense of the far greater *enabling* power that the sector has to offer: that is, its potential to enable *other sectors* to reduce their emissions (e.g. via enabling smart agriculture, smart mobility etc.). According to him, the electronic communication sector could help to enable 15-20% reduction of overall greenhouse gas simply via the connectivity it provides (that is 10 times more than the sector's own emissions).

The life of digital devices has been steadily decreasing and '**e-waste**' (which includes device waste) **is the fastest growing type of waste**, and northern Europe produces the most of it per capita. By way of illustration, it takes 32 kg of raw materials to produce a microchip of 2 g. The key issue for Europe is therefore raw material depletion, and sustainable use of raw

[1] Eco-Management and Audit Scheme of the EU Commission https://ec.europa.eu/environment/emas/index_en.htm
[2] Global Enabling Sustainability Initiative https://gesi.org/about
[3] https://sdgs.un.org/goals

material. Thus, it will be essential to concentrate on using the equipment longer, improve its reparability, fight built-in obsolescence, foster re-use and secondary use of material from recycling rather than importing still new devices or precious metals. The upcoming **EU Circular Electronics Initiative** (due by 2021) will aim to extend the lifespan of devices, prevent premature obsolescence, and promote repair/recycling and efficient resource use for electronics.

Mr Iakovidis pointed out that **estimates of the sector's environmental footprint vary widely due to different measurement approaches**. Estimates show that the ICT sector is responsible for 8-10% of global electricity consumption and for 2-4% of global carbon emission. There are many different methods for measuring the footprint of the ICT sector with quite a big discrepancy in the results they produce. For this reason, the Commission is now working with ICT companies and stakeholders including NGOs and experts to agree on transparent, consistent and standardised methodology to calculate the net impact of ICT on environment / climate more accurately, and especially to calculate the enabling potential of the digital sector in terms of positive environmental change.

Mr Nikolaos Dendramis explained that **the Commission is assessing possible transparency measures** for electronic communications networks and services. The idea behind this would be to better inform end users of the environmental footprint of networks and services, thereby empowering them to opt for greener choices (e.g. choose the greenest provider). This can turn sustainability into a new parameter of competition and incentivise green approaches by operators. To support this work, the Commission has commissioned a **study on greening cloud computing and electronic communications services and networks**.

The recent **Connectivity Toolbox Recommendation** (2020/1307 of 18 September 2020) calls for a 'Toolbox' of measures based on Member States' best practices. In terms of sustainability this should include: 1) criteria of green networks and 2) incentives for operators to deploy such networks.

Furthermore, the upcoming review of the **Broadband Cost Reduction Directive** will also consider possible incentives for the deployment of greener networks, for instance in relation to fees and permits.

Mr Juan Arregui Mc Gullion added that the **EU's Digital Strategy has a specific target for data centres to be carbon neutral by 2030**. Although electricity is the most significant factor of energy consumption, the EC is taking a holistic approach to include all elements of data centres operations: water cooling, re-use of heat, lifecycle of equipment, etc. The size of data centre matters: large operators (often non-EU but with infrastructure operated in the EU) can and do take steps towards sustainability, but in the EU most data centres operators are small, making it less likely that they are operating in 'green' way. He pointed out that it is important to look at ways to support them to transition to green, such as mobilising financial incentives, making best use of public procurement, and best use of new EU funding programmes such as DEP, CEF2, HEU, RRF,the InvestEU fund, etc. The location also matters, for instance, Northern and western EU is rich in wind power and hydrogen. One of the main objectives of the EC's work will be to assess the many energy efficiency indicators available in order to be able to compare outcomes and develop a set of policy options to reach the 2030 objective.

Mr Iakovidis then concluded by underlining that there are clearly ways to make the telecoms sector more environmentally sustainable. Cooperative work ongoing at the EU level – including by the Commission and German Presidency (e.g. Council Conclusions due in December) – should help in this respect.

2. Input from the German EU presidency on policy recommendations for environment-friendly digital infrastructures - Dr. Eva Kracht

Dr. Eva Kracht, Deputy Director General for European Policy in the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, set out some of the views of the German EU Council Presidency 2020 on this topic and provided information on national level activities of the German environment ministry.

First, it will only be possible to make effective policy interventions when we can accurately measure the footprint of things like data centres and networks. **For the moment, scientific estimates vary widely** (e.g. estimates on data centres vary by a factor of up to 5). At the national level, Germany has been conducting a **research project on cloud computing**, which is based on **real measurements** considering the production and use phase. It has two main findings to date[4]: 1) that due to technology, workload etc., there is an extremely wide range of environmental performance across data centres; and 2) that overall, the environmental impact of cloud computing depends on the transmission technology to a far higher extent than previously assumed.

In Germany, there is support for designing an **environmental label for data centres** (binding energy certificate). A methodology for this is being developed, making use of key indicators. One goal is to increase the degree of utilization of IT and infrastructure. Moreover, a fast and **energy efficient roll-out of broadband networks is needed**. For this, all Member States should integrate the relevant environmental standards on data centres (ideally developed at the EU level) into their procurement plans. The re-use of waste heat also needs to be tackled and better planning to improve device production and lifecycle is needed.

Mrs Kracht informed participants that the German Presidency is planning to adopt Council Conclusions[5] in December 2020 in the area of digitalisation and the environment (including data centres, digital passports, 5G roll out and finances). With the right infrastructure, the EU would be able to deliver on the Green Deal goals. In this respect it is important to focus on investing in research that can be quickly translated into results.

[4] https://publicarea.admiralcloud.com/p/iRg9WDwNJTyyr1D21Bx4mY

[5] https://www.consilium.europa.eu/en/press/press-releases/2020/12/17/digitalisation-for-the-benefit-of-the-environment-council-approves-conclusions/

3. Assessing the environmental impact of ICT: Sectoral reference document for the telecommunications and ICT services sector - Commission's Joint Research Centre - Ioannis Antonopoulos

Mr Ioannis Antonopoulos of the JRC presented on the **EMAS[6] Sectoral reference document for the telecommunications and ICT services sector**. This sectoral reference document contains **a set of 'Best Environmental Management Practices' (BEMP)[7]** that aim to reduce the environmental impact of companies/organisations from the telecommunications and ICT services sector.

BEMPs have been identified and developed for data centres, telecoms and end user devices. They come along with specific environmental performance indicators that are already in use by organisations and companies and allow measurement of environmental performance of organisations. Their main environmental aspects and impacts are facilities, Infrastructure, equipment, and software. In addition, benchmarks of excellence set the level of environmental performance already achieved by the best performers of the sector.

BEMPs have been developed under the EMAS[8] Regulation framework, in close cooperation with stakeholders and are available for eleven sectors. The EMAS Regulation Framework has two outputs; the **Best practice report** which contains the BEMPs in details (available in English only), and the **Sectoral reference document** (in all EU languages), which is a legal text and shall be adopted as an EC decision. For the telecommunications and ICT services sector, the best practice report is already available[9] whereas the Sectoral Reference Document is expected to be adopted by the European Commission in 2021.

4. "Input from peers": Energy Regulators and Sustainability, Annegret Groebel

The energy sector has the overall objective of reaching carbon neutrality by 2050. Unlike telecoms, however, energy regulation assumes a natural monopoly and over time, new responsibilities have been added, including fostering competition, overseeing the renewable energy transition and fostering innovation (i.e. fostering the 'enabling' factor, such as smart meters). With the system moving towards a higher share of renewables, there is a need for more flexibility in regulating and steering the network.

Ms Groebel underlined that this **green energy transition is reliant on the use of digital**. For this reason, dynamic regulation is needed. The Council of European Energy Regulators (CEER) has adopted its **3D Strategy for empowering and protecting the consumers**: digitalisation for the consumer, decarbonisation at least cost, and dynamic regulation (the

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[6] Eco-Management and Audit Scheme : https://ec.europa.eu/environment/emas/index_en.htm
[7] More details about the development process of BEMPs available online at: https://susproc.jrc.ec.europa.eu/product-bureau/sites/default/files/inline-files/DevelopmentSRD.pdf
[8] EMAS Regulation: https://ec.europa.eu/environment/emas/emas_publications/policy_en.htm
EMAS Sectoral Reference Documents: state of play: https://ec.europa.eu/jrc/en/research-topic/best-environmental-management-practice
[9] https://susproc.jrc.ec.europa.eu/activities/emas/telecom.html

system becomes more flexible and dynamic, so the regulation must become too). Each year (2019–21), the CEER takes one of these topics as the key topic and it has already published several documents. The collaboration with other types of regulators, as well as stakeholders and consumers (e.g. via BEUC) has already begun in the energy sector on the European level.

The EU's Green Deal and the next generation of funding packages are influencing how energy infrastructure will be invested. The **TEN-E regulation** review will be a chance to **push Green Deal objectives further**. The energy system must be integrated as a whole, i.e. integration of the electricity dimension with the gas networks is needed and they must be planned together. The unused renewable electricity can produce green hydrogen. Thus, the network must be adapted from transporting fossil energy produced in large power plants towards a system of transporting renewable energy produced in a more decentralized way. This can be funded as so-called projects of common interest (PCIs) under certain conditions from various sources. In a position paper ACER/CEER proposed 18 improvements in three areas (infrastructure governance, scope of PCIs, and TEN-E processes) toward greener infrastructure.

5. "Inputs from peers": the RSPG's strategy to combat climate change, Robert Lindgaard and Rory Hinchy

RSPG's work on climate change began in March 2020. Internal discussions have addressed **what role the spectrum can play in the environmental debate** and various possibilities have been discussed (such as the possibility of protecting spectrum use relevant for climate change monitoring).

RSPG have also **gathered stakeholders' views**. Some, such as GSA (who represent manufacturers) reports that innovation works the best when regulation does not impose any standards to be used. GSA also mentioned that **removing legacy 2G/3G equipment could help**. Another example is GSMA, who created a Climate Action Toolkit for mobile operators.

Based on the above, **RSPG is discussing whether to call for actions from relevant stakeholders (the EC, Member States, end users, industry, etc.).** For example, it could call on the industry and end users to consume only electricity generated from renewables, and on responsible entities to preserve the long-term protection of spectrum use for climate-related data.

RSPG is beginning to explore a number of questions, e.g., what scope is there within the new EECC to impose terms and conditions on future spectrum licences? What scope is there to amend existing licences with greener T&Cs, etc.?. RSPG is considering what actions it should next recommend and where potential challenges may lie, e.g. possible clashes with the principles of transparency/consistency, etc.

Day 2: Understanding the role of Stakeholders and how BEREC can involve them in the process

1. The environmental impact of ICT from a global perspective - International Energy Agency, George Kamiya

Mr George Kamiya from the International Energy Agency (IEA) highlighted **the scale of the change happening in the digital environment**, with internet users increasing 11-fold, average PC hard drive capacity 28-fold and internet traffic increasing 2000-fold between 2000 and 2019.

Seeing this **enormous rise of internet traffic**, it is remarkable that from 2010 to 2019, following IEA data, the energy use of data centres only rose by 3%, while internet traffic rose 12-fold. In 2019 data centres consumed around 200 TWh globally, or approximately 0.8% of global electricity use. Asked about Ms Kracht's statement on the divergence of data on energy consumption of data centres, Mr Kamiya acknowledged that there is a **lack of common methodology between studies as well as challenges around data availability**.

Data centre energy use remained flat thanks to 1) significant shift from less efficient traditional data centres to much more efficient cloud and hyperscale data centres; and 2) energy efficiency of computing and data transmission has doubled every 2-3 years.

It is important to note that ICT companies are amongst the top purchasers of renewable energy (mostly through corporate power purchase agreements). The sector recently set target under the Science-Based Targets initiative (SBTi)[10] to reduce emissions by half in the next decade. Moreover, as data centres consume energy for 24 hours a day, it's difficult to ensure it is fully supplied by renewable or carbon free energy for all the time.

Regarding longer-term outlook for the ICT energy use,there is a risk that data centre energy **efficiency gains might not keep up with growing data demand**, with some efficiency indicators beginning to slow down and the so called "**rebound effects".** New applications and technologies, machine learning, blockchain, etc. accelerate demand growth. Even if data centres and telecom networks have made good progress on energy efficiency and renewable energy procurement, the situation could change if efficiency gains cannot keep track of the rapid growth of the sector.

Finally, Mr Kamiya made clear that **with current climate and energy policies unchanged, global CO2 emissions are unlikely to fall**, remaining well off-track from the rapid decrease in emissions needed to reach the goals of the Paris Agreement. To align with a "well below 2C" scenario (IEA's Sustainable Development Scenario),[11] rapid progress on clean energy innovation is needed. Today's rapidly commercialising newest and most promising technologies are required to reach net-zero by 2050 or 2070.

[10] See below
[11] https://www.iea.org/reports/world-energy-model/sustainable-development-scenario#abstract

2. Public – Private Partnerships for Sustainability in ICT - Global Enabling Sustainability Initiative (GESI), Luis Neves

The GeSI was originally an initiative driven by the UN Environment Programme (UNEP) which aimed to build a global coalition at the intersection of new technologies and sustainability. Progressively, various private actors from the ICT sector joined GeSI until it became a multi-stakeholder platform which integrates various sectors and industries. Today, in collaboration with members from major ICT companies and organisations around the world, GeSI is considered as a leading source of impartial information, resources and best practices for achieving integrated social and environmental sustainability through digital technologies at all stages of the Internet value chain.

In February 2020, GeSI, Science Based Targets initiative (SBTi), ITU, and GSMA edited a guidance report for ICT operators, the Science Based Targets (SBT). This report stated that targets must cover company-wide scope 1 and scope 2 emissions as defined by the GHG Protocol Corporate Standard. These SBT for emissions trajectory reductions between 2020 and 2030 implies that: fixed network operators are supposed to reduce emissions by at least 62%; mobile network operators by at least 45%; and datacentre operators by at last 53%.

Moreover, GeSi proposes **three means to promote sustainability through public procurement**: prioritizing service providers that can deliver less carbon-intensive products, introducing a scoring system, and adapting those criteria to national conditions.

GeSI supports different initiatives: the Responsible Minerals Initiative, the GeSI Smarts reports, the EU Codes of Conduct on Energy Consumption of Broadband and on Data Centres, and the Digital with Purpose Movement.

The Digital with Purpose Movement commits participating companies to act in order to reach the ambition level of the Digital with Purpose report[12] recommendations, i.e. to recommit to the UN Sustainable Development Goals (SDGs),[13] take bold action on climate change, commit to impact transparency and to the impact-led development, and deployment of digital technologies. GeSI is developing a quantitative framework to score companies against their commitment to the pledge and to encourage corporate commitments to the amplification and acceleration of SDG impact through digital technologies. According to performance, organizations can receive four accreditation labels “digital with purpose:” committed, developing, pioneering, and diamond. This independent framework with indicators covers six pillars: purpose, climate change, supply chain, trust and responsibility (privacy), circular economy, and digital inclusion. It allows companies to understand their performance in relation to a shared ambition and constitutes a learning process to further develop innovative solutions based on the existing companies’ good practices (climate change pillar).

Besides, and according to the Digital with Purpose report, digital technologies could allow us to positively impact 20% of the SDGs goals and reduce 23% of the negative trend. Telecommunications operators have been successfully investing to reduce their carbon footprint and there are also benefits for end users. Mr Neves insisted on the fact that

[12] https://www.gesi.org/platforms/digital-with-a-purpose-delivering-a-smarter2030
[13] https://sdgs.un.org/goals

sustainability must be taken as a competitive factor for companies when seizing their development plans and investments.

Mr Neves' final statement was to remind his position: companies should drive business value to climate goals and accept the enabling role of corporate activities.

3. The role of Industry, Ericsson, Mats Pellbäck Scharp

The climate targets of Ericsson focus mainly on the products that are used in telecom operations, being the network equipment. According to the speaker, during the lifecycle of Ericsson products, about 80% of its total CO2 emission is caused by the products in operation. This is totally different from consumer end-devices. Consequently, **Ericsson aims to decrease the operational energy consumption of its equipment**. In that respect, the 5G portfolio will be 10-fold more efficient than 4G by 2022.

Advancements in digital networks have a huge impact on sustainability. Since the beginning of mobile networks, every release of a new standard resulted in a significant increase of energy consumption due to the rebound effect. It is expected that global mobile data traffic will increase five times by 2025 which will lead to a higher increase of energy consumption. Ericsson aims to break this upward energy curve by **using new innovative technologies** such as activating energy-saving software (7-15%) to build the right infrastructure of the network with the right equipment at the right place. Ericsson also proposes to **utilize the available spectrum as much as possible for 5G technology and to replace old energy consuming technology and equipment**.

Next, Mr Pellbäck Scharp mentioned the cooperation on industry trajectory which aims toward zero emission for fixed and mobile networks. This is backed by ITU that has set the standards. He expressed that ICT operators can participate on competition basis, but regulators can push the laggards.

Ericsson is a member of the “Exponential Roadmap Initiative” that aims to halve the emissions by 2030 and to achieve the net zero emission before 2050. Through this initiative, Ericsson is also co-founder of the “1.5°C Supply Chain Leaders” initiative. They provide guidelines that can be used by the industry or SME to reduce emissions by choosing the right suppliers.

Regarding digital inclusion, **ICT acts as an enabler for carbon emission reduction**. In this respect, Ericsson offers the Network as a Service. He showed some of its examples such as reducing transportation emissions, reducing the carbon emissions of mining industry, 5G in the port of the future and the deployment of IoT.

Main points of the panel discussion

> *What sort of action could be taken to use the sector as an enabler rather than trying reduce its own environmental footprint. Balance should be find between ensuring competition and integrating sustainability.*

There are solutions for combining the two but investigations on this point are only at their beginning. Exact KPIs (i.e. for greening the sector, as well as estimating its 'enabling potential') are urgently needed. There are currently no KPIs at all on the sector's 'enabling' potential.

The choice between competition and sustainability is not a binary one, and there are various ways to combine these.

What are the recommendations to tackle the so called 'rebound effects?

The French SHIFT project[14] documents this and the key is to tackle individual behaviour.

Are there any estimates regarding the cost to make the ICT industry green?

There are studies that look at this sector by sector, but no one presents a holistic figure. Just for the software necessary for greening, however, there are estimates in the range of 2.5-3 billion euros. This is a very hard question to answer accurately however, due to many external/fluctuating factors. E.g.: data centres can choose their location, while telecom companies must be present everywhere.

A framework should be set for investments in green transitions.

At the end of the day we need to look at total energy consumption of the sector. The problem with telecoms is that they are requested to carry more bits and bytes. Is this unfair? What about the efficiency per bit carried?

The absolute emissions are what matter in terms of climate impact. Even if efficiency is increased 10-fold, a large rebound effect could negate (or even outpace) these improvements. A better dialogue between the different parts of the value chain is needed, e.g. between network operators, digital platforms, and device manufacturers. Less frequent replacement of devices could help to reduce the lifecycle environmental impact of, in particular, smaller devices. Also, the country specificities matter: the energy per subscriber is very different. Starting point is to get better data and better transparency from operators and manufacturers and then set energy targets with the goal of zero emissions. Compared to other sectors like transportation and industry, the ICT sector is perhaps easier to decarbonize.

[14] https://theshiftproject.org/en/home/