BEREC's input to the EC public consultation on the White Paper "How to master Europe's digital infrastructure needs?"

28 June 2024

Contents

1. Introduction

The European Commission (hereinafter: the EC) published a *White Paper - How to master Europe's digital infrastructure needs?[1]* (hereinafter: White Paper) on 21 February 2024. The document elaborates on the trends and challenges in the digital infrastructure sector and puts forward possible scenarios aimed to overcome the problems identified. The White Paper is submitted to public consultation until 30 June 2024.

The Body of European Regulators for Electronic Communications (hereinafter: BEREC) contributes to the development and better functioning of the internal market for electronic communications networks and services and provides advice on request and on its own initiative to the European institutions on any technical matter regarding electronic communications within its competence. In line with its mandate, BEREC is tasked with the assessment of the functioning of the electronic communications' legislative framework. By way of example, BEREC will share this year its views around IP interconnection, sectoral end users' rights, General Authorisation and the implementation of the European Electronic Communications Code[2] (hereinafter: EECC) provisions around co-investment and wholesale-only undertakings[3]. These detailed analyses, upon their conclusion, are to be considered as additional inputs for the White Paper, as well as for the upcoming review of the EECC in 2025. Furthermore, BEREC is involved in several activities relating to the wider digital sector, including the Digital Markets Act (hereinafter: DMA) implementation, and investigations into areas such as content and application providers (hereinafter CAPs) investment in electronic communications services (ECS) and electronic communications networks (ECN) (hereinafter: ECS-ECN) and in relation to submarine cables, and has developed its vision for an EU regulatory environment fit for the digital age and the global context in its 2030 Action Plan[4].

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[1] COM(2024)81, WHITE PAPER How to master Europe's digital infrastructure needs?, 21.02.2024, see: https://digital-strategy.ec.europa.eu/en/library/white-paper-how-master-europes-digital-infrastructure-needs

[2] Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code, 17.12.2018, see: https://eur-lex.europa.eu/eli/dir/2018/1972/oj

[3] For an outline of BEREC deliverables 2024 see the BEREC Work Programme 2024 available at https://www.berec.europa.eu/en/berec/annual-work-programme

[4] BoR(23)48, BEREC Action Plan for 2030, 9.03.2023, see: https://www.berec.europa.eu/en/document-categories/berec/others/berec-action-plan-for-2030 . The Action Plan develops around five strategic orientations: i) fostering national and international connectivity to reach the objectives of Europe's Digital Decade by 2030; ii) facilitating an open and sustainable internet ecosystem and supervising the evolution of the digital landscape; iii) providing for the security and resilience of the networks and services; iv) contributing to the achievement of environmental sustainability goals and v) strengthening BEREC's agility, independence, inclusiveness, and efficiency as a centre of expertise.

BEREC agrees that the latest market and technology trends – addressed in the following chapter - are impacting the electronic communications and digital sector, thus potentially requiring relevant adjustments. BEREC believes that such adaptations need to be addressed in a holistic perspective for electronic communications' regulation.

BEREC notes that the White Paper is programmatic in nature; thus, only once the high-level principles and the regulatory options in the White Paper are translated into actual legislative proposals, can a fully-fledged assessment be developed. In relation to that, by the end of 2025, as required under Article 122 of the EECC, the EC shall carry out a review of the functioning of the EECC, evaluating in particular the effectiveness of the current market regulatory tools and the scope of Universal Service. The EC shall also consider the BEREC's specific review procedure regarding end-users' rights[5], which is due to be completed by the end of 2024. Moreover, according to Article 48 of Regulation (EU) 2018/1971, the European Commission shall carry out an evaluation to assess BEREC's and the BEREC Office's performance, addressing the possible need to modify their structure or mandate. The ideas sketched out in the White Paper are to be read in conjunction with regulatory areas not covered by this initiative (including, among others, not only digital infrastructure regulation, but also end-users' rights, internet openness and the institutional design, all of which are closely interrelated) and shall furthermore be fine-tuned in the light of the assessments required under the EECC, to define the future regulatory framework for electronic communications.

Turning to the scenarios outlined in the White Paper, as regards the proposed introduction of the Country-of-Origin (CoO) principle for core networks and core network services, this concept is not elaborated in detail and, in particular, the scope of core networks and services is not defined in the document[6]. However, it can be said that providers in the core network are also, typically, present in the access network and, thus, under a CoO approach, they would be subject to different national jurisdictions and would not benefit from the alleged advantages of such approach. BEREC further cautions about the potential risks of creating an uneven playing field associated with such a system (by creating a two-class system for those providers only present in the core networks and those who are more vertically integrated), legal uncertainty and the potential rise of forum shopping practices. In order to support providers in

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[5] Art. 123 of the EECC

[6] Neither the delimitation between the core and the access network, nor the scope in relation to the physical - that, by nature, has a geographic scope - and virtualized layers

gaining further scalability in the context of network virtualization and cloudification, BEREC would propose an alternative through fostering the development of a harmonized approach aimed at ensuring openness, standards and interoperability and regulatory monitoring in order to avoid hampering competition (e.g. vendor/cloud lock-in), net neutrality and data privacy.

Furthermore, BEREC retains a positive view regarding the performance of the EU compared to other regions of the world. Considering the importance of reliable data to fully understand the EU needs for a forward-looking assessment of sectoral regulation, BEREC recommends a more systematic and in-depth analysis (covering also the demand side, as a key driver for the connectivity investments) of the EU market, to ensure a normative approach, as succinct and comprehensive as possible.

BEREC also notes that the experiences implementing the EECC may currently be limited in some countries, as transposition was completed at differing rates across Member States. Along the same lines, BEREC finds it worth reminding that relevant regulation complementary to the EECC such as the Gigabit Infrastructure Act[7] (hereinafter: the GIA) has recently been approved. Both the EECC and the GIA include specific provisions on access regulation and remedies that need full implementation within a reasonable period to show their effect.

On the merits of the ideas sketched out, BEREC agrees with the EC that the availability of high-quality, reliable, secure, and sustainable connectivity for everybody and everywhere in the Union, including in rural and remote areas, is key.

Furthermore, BEREC supports the view of reflecting on the appropriate scope of the framework, in light of recent market and technology trends. Concerning the sectoral goals, BEREC welcomes the proposed introduction of the environmental sustainability objective in the sectoral legislative framework and, more in general, the attention devoted to environmental issues in the White Paper. BEREC shares the EC's ambition to promote the development of sustainable networks and technologies in support of environmental transition goals, while also working in minimizing their environmental footprint and therefore supporting the measures

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[7] OJ L, 2024/1309, Regulation (EU) 2024/1309 of the European Parliament and of the Council of 29 April 2024 on measures to reduce the cost of deploying gigabit electronic communications networks, amending Regulation (EU) 2015/2120 and repealing Directive 2014/61/EU, 8.5.2024, see: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1309

envisaged to improve the measurement and transparency of the environmental impact of the digital sector.

BEREC shares the goal to increase the competitiveness of Europe's economy, ensuring a regulatory level playing field in the electronic communications sector, decreasing the regulatory burden for companies while underlining the role of ECN-ECS regulation as a cornerstone for EU digital competitiveness. At the same time, guaranteeing competition and users' rights is essential to ensure that connectivity and choice are provided under the right conditions (i.e. availability, affordability, quality, transparency, etc.), to ultimately enable EU users and industry access and provide digitally-enabled services and to innovate in the digital sector. A robust competition framework therefore fuels the competitiveness of the EU single market. All in all, European competitiveness shall be fostered across the economic fabric, without being constrained to predefined undertakings, and without foregoing or deprioritising the other goals enshrined in the electronic communications' legislative framework.

In this respect, the introduction of industrial competitiveness and economic security to the set of sectoral objectives should not be to the detriment of the current objectives pursued in the electronic communications sector, i.e., promoting connectivity, competition, the completion of the single market and the protection of end-users' rights. Those objectives would be at risk in a scenario of market consolidation leading to few pan-European players. There are indeed no guarantees that measures leading to such a scenario would help advancing the single market as long as ECN and market dynamics remain national. It should also be ensured that the competition paradigm at the foundation of the current regulatory framework, which has proven effective so far in pursuing the sectoral goals, should not be hindered, keeping a distinction between competition and industrial policy measures.

BEREC is also of the opinion that a strategic Union-wide approach to security and resilience of critical digital infrastructures is essential for the EU's economic security and that terrestrial, non-terrestrial and submarine connectivity solutions have complementary role for maintaining uninterrupted services across the European continent.

While BEREC's thinking on the EC's ideas is developed in the following chapters, BEREC points to the fact that relevant thematic areas in the current electronic communications' legislative framework, such as Open Internet and end-user protection, are not subject of the White Paper reflection.

BEREC wishes to highlight that any legislative intervention in the field of digital infrastructures and services of the internet ecosystem must be consistent with the Open Internet rules , whose importance BEREC stresses again, in line with its contribution to the EC's exploratory consultation on the future of the electronic communications sector and its infrastructure. BEREC believes that the importance of the Open Internet principle should be highlighted throughout the wider digital ecosystem that the White Paper addresses, in light of the need to promote its openness, to the benefit of innovation as well as end-users' rights and empowerment. The same need to protect and empower end-users' rights arises in the Computer Continuum and is not addressed in the White Paper. BEREC also notes the specific review procedure outlined in Article 123 of the EECC related to end-user rights, which involves assessing the extent to which Title III of Part III meets the objectives set out in Article 3 of the EECC. The outcomes of such review should also be taken into account as an essential additional input for the evolution of the framework.

BEREC remains available to contribute to future EC's initiatives falling within its remit, including around the governance of the digital sector, where it is of the view that independent national regulators, endowed with the necessary sectoral tasks and powers, should still play a pivotal role and any unfounded centralisation of processes should be avoided.

2. Technological trends and market developments

Market and technology trends

As the White Paper rightly recognizes, the electronic communications sector in Europe is undergoing a profound change in its functioning due to technological advances such as, but not limited to, cloud and edge computing, the virtualization of the network functions, the ubiquitous need for data processing services and the increasing interaction with new digital actors (e.g., as a consequence of the entry of large CAPs in the traditional markets closely related to ECN and ECS, or directly qualifying as such). Such developments take place in a context of new challenges for the sector (in terms of resources, resilience etc) as well as of climate change.

Looking at how electronic communications providers reassess and reshape their business models reveals several noteworthy aspects.

Firstly, while some of the vertically integrated telecom providers continue to control the overall value chain, BEREC notes a strong trend towards disintegration, with the traditional ECN-ECS sector correspondingly not being at the centre but turning into being a part of a much wider value chain. Indeed, some providers that are focused on the provision of infrastructure only are emerging, which is linked to the ongoing processes of infrastructure divestment by vertically integrated telecom companies. This is evident in European mobile markets, where currently most towers/masts and sites are owned and operated by infrastructure companies[8] and a similar trend is also observed in the fixed markets. The main reasons for such trends lie with cost saving and value creation where it is needed to unlock capital for the investments required to provide gigabit connectivity services to consumers and businesses. In other terms, investment funds are contributing to financing telecom, while telcos are focussing on core competencies (including increased valuations and release of capital) and/or achieving operational efficiencies. In parallel, also wholesale-only providers are emerging, with the telco model developing into a wider variety of operators. Quite importantly, such trends lead to the emergence of players that are typically not active at the retail level.

Secondly, the telecom sector has been quite reactive to changes in the markets, with broadband players entering into joint-ventures and/or various forms of partnerships for the deployment of new very high-capacity networks (hereinafter: VHCN) with other operators (including utilities operators), infrastructure funds or the State/Government. Many of these entities have been set up to fill in gaps in the coverage areas which may be commercially viable but are considered underserved, while in some other countries (e.g., PT, FR, IE) the focus is mainly on rural areas with State aid support. The trend of concluding such partnerships is expected to expand also with regards to digital players, resulting in a combination of a wide array of services provided to end-users (IoT, high-quality streaming, AI services etc.) over collectively deployed networks.

Even though access networks and internet or voice access services are largely provided by ECS-ECN operators, competition from other actors of the internet ecosystem (e.g. CAPs) is emerging in the last decade. For example, CAPs and newcomers invest in communications infrastructures such as LEO (Low Earth Orbit) satellite networks (e.g. Amazon with Project

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[8] BoR(23)206, BEREC Study on the evolution of the competition dynamics of tower and access infrastructure companies not directly providing retail services, 7.12.2023, see: https://www.berec.europa.eu/system/files/2023-12/BoR%20%2823%29%20206_Rev1_Study_towernetco_PUBLIC_0.pdf

Kuiper, SpaceX with Starlink) or in 5G private networks for businesses. However, these services are not yet taken up on a broad scale: the take-up of 5G private networks services is still developing slowly and LEO satellite networks are mainly used in very rural areas with poor fixed and mobile coverage. Some CAPs also started deploying their own fibre access networks[9], however, such cases are limited as access networks remain difficult to replicate due to economies of scale and large sunk costs. Other examples of CAPs' infrastructural investments include content delivery networks (hereinafter: CDNs), the deployment of extensive international networks (e.g. submarine cables and satellite constellations), data centres with increasing ubiquity that enable the provision, among an enormous array of other digital services, of virtualised network services, as well as trends towards expanding the large CAPs' footprint to the lower layers of the internet ecosystem, typically by means of agreements with traditional ECN-ECS providers.

Thirdly, there is a general reassessment of business opportunities on the telecom operators' side, with re-evaluation of strategies and priorities as regards investments, some having a clear focus on expanding beyond their national footprint, while others preparing exit strategies from some of the markets or selling of key assets to finance core activities.

In addition, many ECN-ECS operators are increasingly embracing virtual and cloud-native network architectures[10] and sometimes enlarging their portfolio to also become digital service integrators. As a matter of fact, network virtualization not only allows operators faster deployments at a lower cost, transforming CAPEX into OPEX, efficiencies and more flexibility in the operation of the services, but also moving up into adjacent sectors in the value chain and adopting the business model of digital service providers via the provision of NaaS (Network-as-a-Service). ECN-ECS, IT and cloud/edge computing services are becoming increasingly intertwined and the boundary between ECN-ECS and the cloud services providers becomes more and more blurred.

Cloud and electronic communications relate along four main areas: a) the connectivity required for the provision of cloud and edge computing; b) the migration of ECN to the cloud

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[9] E.g. Google Fibre in the USA, and Sky Italia uses access to fibre networks to provide retail internet and bundled services in Italy.

[10] BoR (23) 208, External study on the trends and cloudification, virtualization, and softwarization in telecommunications, 07.12.2023, see: https://www.berec.europa.eu/en/document-categories/berec/reports/external-study-on-the-trends-and-cloudification-virtualization-and-softwarization-in-telecommunications.

considering different elements and functions of the network (core, RAN edge, backhaul and transport as well as network operation and orchestration); c) the provision of new and enhanced ECN-ECS by means of cloud-based network services (i.e. Network-as-a-Service, NaaS) and d) the supply of bundled and integrated ECN-ECS and IT services with cloud.

Along these lines, BEREC acknowledges the current convergent trends described in the White Paper and points to risks similar to those identified by the EC that may challenge the healthy development of cloud and edge services in the EU[11].

BEREC has already analyzed network virtualization and convergent trends[12] and believes that network migration towards the cloud is costly, lengthy and still at an early stage; it is therefore still uncertain if or how these changes may be disruptive to the current vertically integrated model of network management and provision, leading to their disaggregation. It is expected that such changes will be taking place progressively over several years. In some cases, ECN providers may decide not to migrate certain functions to the cloud due to their sensitivity or other reasons of opportunity.

In this process, ECN providers may also adopt different strategies to implement network virtualization. They may decide to buy or build their own solutions (including a large range of intermediate solutions based on diverse degrees of externalization and different types of partnership with other players such as vendors or cloud providers). They will also have to consider the use of private, public or hybrid clouds[13].

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[11] BoR (24) 52, Draft BEREC Report on Cloud and Edge Computing Services, 7.3.2024, see: https://www.berec.europa.eu/en/document-categories/berec/reports/draft-berec-report-on-cloud-and-edge-computing-services. The draft describes how cloud and electronic communications interplay and, against this backdrop, gathers regulatory considerations around network cloudification relating to: i. the definitions and scope of the EECC; ii. Competition implications regarding ECN/S and cloud/edge convergence are approached from four different angles: a) the impact on ECN/S markets; b) on the cloud markets; c) the partnerships between ECN/S and cloud providers and d) the implications of ecosystems including the risk of leveraging market power into adjacent markets; iii. The importance of APIs openness an exposure risks; iv) investments conditions and possible obstacles both regarding network cloudification and edge computing; v) the interplay among the different pieces of EU legislation impacting ECN/S and cloud/edge computing and the institutional set up to facilitate regulatory enforcement; vi) digital sovereignty, vii) digital divide and viii) environmental impact.

[12] BoR (24) 52, Draft BEREC Report on Cloud and Edge Computing Services, 7.3.2024, see: https://www.berec.europa.eu/en/document-categories/berec/reports/draft-berec-report-on-cloud-and-edge-computing-services and BoR (23) 208, BEREC external Study on the trends and cloudification, virtualization, and softwarization in telecommunications, 7.12.2023, see: https://www.berec.europa.eu/en/document-categories/berec/reports/external-study-on-the-trends-and-cloudification-virtualization-and-softwarization-in-telecommunications

[13] In this regard, BEREC's Report indicates that the cloud is used in the core network for applications that require significant processing power and large storage space. It's also the part of the network where most critical functionalities and sensitive data reside. Therefore, operators seem hesitant to incorporate public cloud providers

CAPs, on the other hand, are striving to move their services closer to the end-user, leveraging their wide IT services portfolio. These developments are driving both competition and cooperation dynamics between CAPs and ECS-ECN operators.

The most obvious and direct area of competition between CAPs and ECS-ECN operators is probably interpersonal communication services (ICS). A BEREC study analysing EU consumer perception and behaviour on digital platforms for communication[14] revealed patterns both of complementarity and substitution when it comes to consumer switching between digital and traditional electronic means of communication. While interoperability of voice and SMS on every GSM handset, regardless of access network or subscription, was and is one of the main reasons of the worldwide success of this European standard and its worldwide successors, another BEREC report[15] shows that interoperability of standard number-based voice and SMS services over 4G and 5G may be less guaranteed than over older network generations. This raises the importance of careful analysis of competition between number-based voice and SMS services and alternative OTT voice and messaging services.

Also, video-streaming content offered by CAPs (e.g., Netflix, Amazon Prime Video, Disney+) is increasingly competing with linear television as well as with cable TV / IPTV-offers from telecommunications operators, which has often led the latter to integrate CAPs SVoD[16] platforms into their own TV environment or develop their own catch-up and on demand TV services. Massive online content distribution (especially live streaming) is re-shaping the relationship between Telcos and CAPs in terms of interconnection.

Another area of (retail) competition is the provision of cloud services and business services[17]. The practice of bundling telecom and IT services is well established, hence, ECS and IT

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into this area. According to a survey led by CapGemini Research Institute, 82% of surveyed companies prefer using internal private clouds for their core network. https://www.capgemini.com/insights/research-library/cloudification-of-networks . Nevertheless, this situation is expected to change in the coming years.

[14] BoR (21) 89, Analysing EU consumer perceptions and behaviour on digital platforms for communication. Analysis report, 10.6.2021, see: https://www.berec.europa.eu/en/document-categories/berec/reports/analysing-eu-consumer-perceptions-and-behaviour-on-digital-platforms-for-communication-analysis-report.

[15] BoR (23) 204, BEREC report on 2G/3G phaseout practics and challenges, 7.12.2023, see: https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-2g3g-phaseout-practics-and-challenges

[16] Subscription Video on Demand.

[17] BoR (24) 52, Draft BEREC Report on Cloud and Edge Computing Services, 7.3.2024, see: https://www.berec.europa.eu/en/document-categories/berec/reports/draft-berec-report-on-cloud-and-edge-computing-services
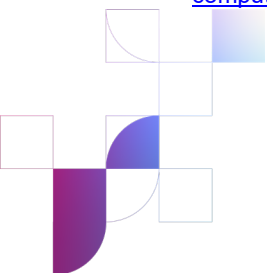
services providers appear to be in an increasing competition for the provision of business services[18].

Partnerships for the joint provision of cloud and connectivity will still be essential in the short/medium term, as no one entity covers the whole value chain. Moreover, hyperscalers are focused on scalability and technologies, such as data analytics and AI/ML, and are less prone to go up to the last mile. ECN-ECS providers have built customer relationship with business users and hyperscalers may prefer to collaborate with operators to reach all business customers. Therefore, operators are establishing collaborative agreements with these big cloud providers, becoming resellers and technical experts, integrators, of their public cloud services.

In the business sector, CAPs also offer unified communication and collaboration (UCC) services including voice services (also to national number plans), video conferencing services, chats, collaboration tools etc., enhancing and also replacing traditional business connectivity services offered by telecommunications operators[19]. Data centres[20] and hosting services are also increasingly provided by firms like Amazon, Google or Microsoft.

There are also many examples of projects where CAPs and ECS-ECN providers cooperate in offering cloud services and by deploying 5G cloud native networks, among other services[21].

Considering all these market and technology dynamics, the need remains for synchronising investment in VHCN with the uptake of both consumer and business demand for high-quality connectivity, with a view to enabling brand-new services. Nevertheless, pursuing the connectivity goal should not be to the detriment of the other objectives that have been effectively guiding telecoms regulation to date, i.e. as said, fostering competition, the internal market and protecting end-users' rights.

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[18] BoR (22) 184, BEREC External Study on Communication Services for Businesses in Europe: Status Quo and Future Trends, 12.12.2022, see: https://www.berec.europa.eu/en/document-categories/berec/others/external-study-on-communication-services-for-businesses-in-europe-status-quo-and-future-trends

[19] BoR (22) 184, BEREC External Study on Communication Services for Businesses in Europe: Status Quo and Future Trends, 12.12.2022, see: https://www.berec.europa.eu/en/document-categories/berec/others/external-study-on-communication-services-for-businesses-in-europe-status-quo-and-future-trends

[20] According to the ACM study, data centres contribute significantly to the economies of scale of cloud services, both with regard to the size of one data centre, and with regard to having multiple data centres worldwide.

[21] Pages 20 – 22 of BoR (24) 51, the Draft BEREC Report on the entry of large content and application providers into the markets for electronic communications networks and services, 7.3.2024, see: https://www.berec.europa.eu/system/files/2024-03/BoR%20%2824%29%2051_Draft%20report%20CAPs%20in%20ECS-ECN.pdf

Some data on the telecom sector in the EU and in other regions of the world

BEREC notes that the assessment of the state of EU electronic communications markets provided by the White Paper is not correctly portrayed. BEREC believes that the current framework has contributed to meet the Digital Decade connectivity goals and Europe seems to be on the right track, with the EU's ex-ante SMP regulatory model being widely regarded as a success story.

As regards Europe's performance in the telecoms sector compared to other jurisdictions, BEREC cannot find any compelling evidence of Europe's claimed underperformance. Europe is performing better as regards some indicators such as fibre coverage and pricing, while other areas outside Europe may perform better in relation to the telecom operators' ability to raise capital or 5G network rollout. Furthermore, on a methodological note, it should be kept in mind that due to the diversity of sources and methodological details/specifics, the figures are considered as reliable in trend and comparable as regards the same source, while caution needs to be exercised when considering absolute values from different sources.

For instance, recent data by region on the number of fixed broadband subscriptions per 100 inhabitants show that Europe has been leading, with a strong growing trend, as it can be seen in the figure below.

Figure 1: Fixed broadband subscriptions in Europe compared to other regions (2005-2023)
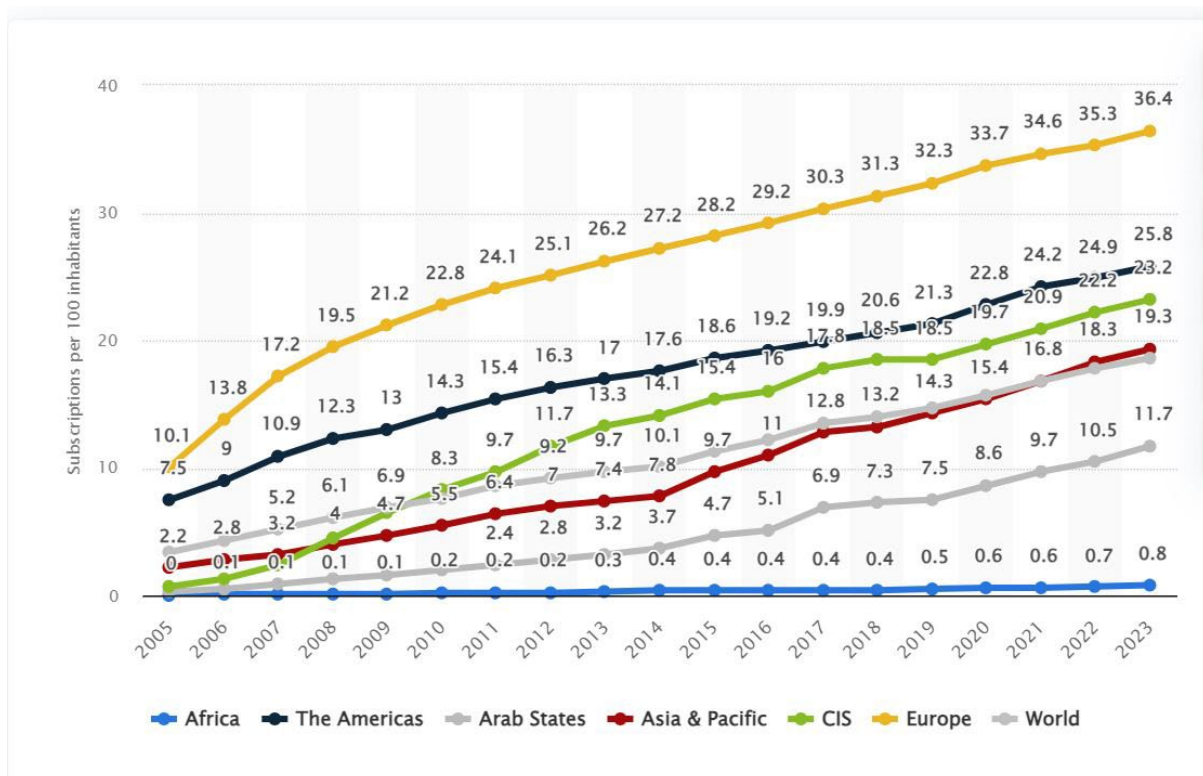
Source: Statista 2024 (ITU) - https://www.statista.com/statistics/370681/fixed-broadband-internet-penetration-region/

Pricewise, the situation generally shows that the broadband prices in Europe are lower than in other parts of the world, as it can be seen from the figure below comparing the 2023 prices for a fixed-broadband internet access service basket providing at least 5 GB in terms of traffic. However, most of the plans in the more advanced economies encompass unlimited traffic.
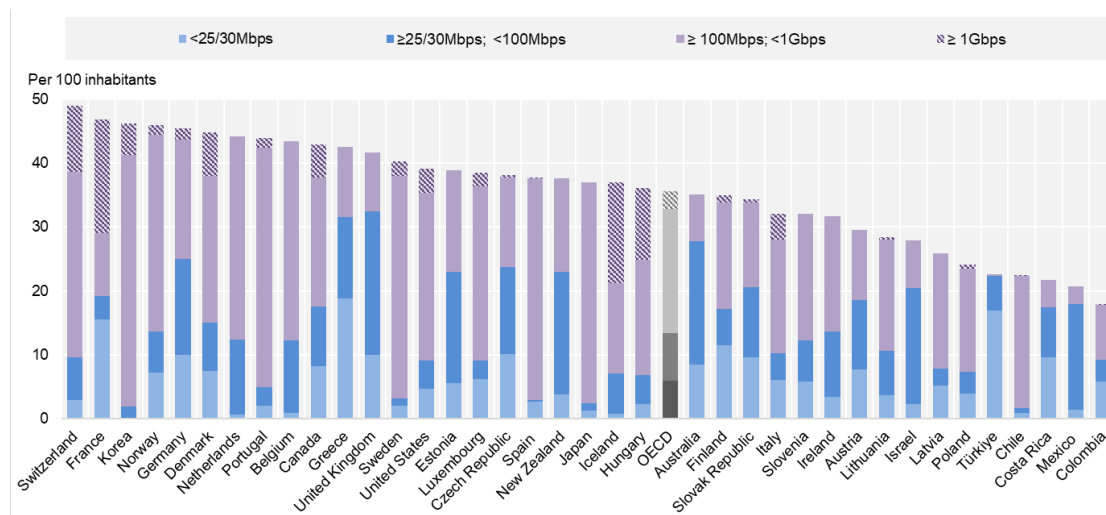
Figure 2:
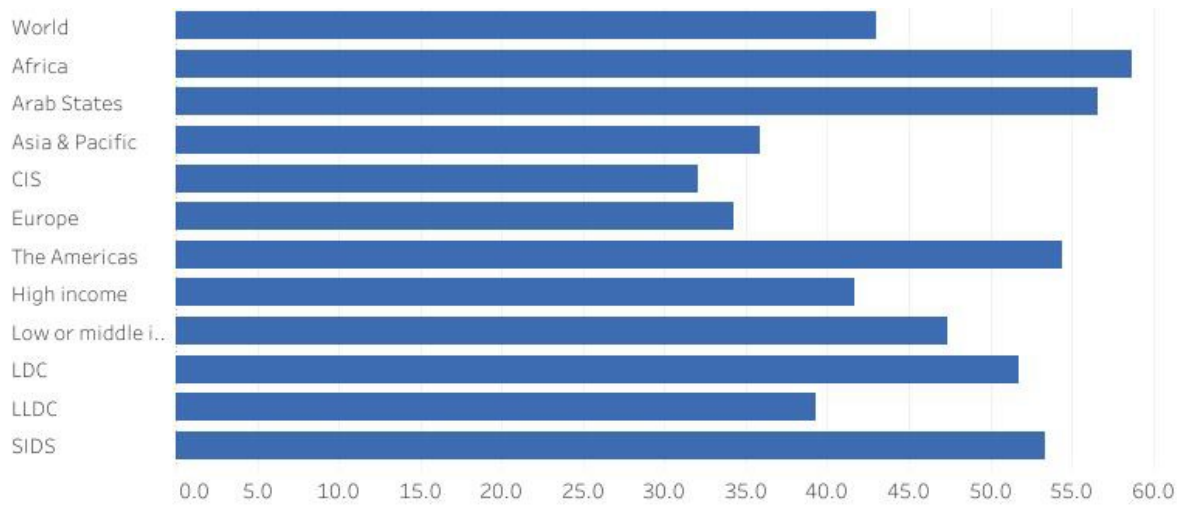
Source: ITU, ICT price baskets, purchasing power parity adjusted

In terms of quality of the fixed broadband internet access services worldwide, OECD presents data on speed tiers as of June 2023, whereby the EU countries seem to be leading in gigabit subscriptions.

Figure 3:

Source: OECD, Fixed broadband subscriptions per 100 inhabitants, per speed tiers[22]

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[22] OECD (2024), "Broadband database", OECD Telecommunications and Internet Statistics (database), https://doi.org/10.1787/data-00682-en (accessed on 26 June 2024)

BEREC also wishes to highlight that this OECD data is based on the maximal bitrate, which is a key metric to be defined as a VHCN connection. However, throughout the White Paper, the Commission equates VHCNs with fibre networks, which is an oversimplification. Many European countries have a significant coaxial cable coverage where VHCN services of 1Gbps and up can be offered, based on Docsis 3.1, in line with the principle of technological neutrality.

As regards 5G deployment, although the 5G EU observatory shows that the ratio between 5G base stations rolled out and population has been higher in countries like China, South Korea or Japan, not in the USA though. By contrast, when considering the ratio between subscribers and population, the EU is performing relatively better. Furthermore, considering the MHz of authorised spectrum (as per the same source) helps explaining that EU 5G BSs can deliver traffic to more 5G subscribers/BS.

Figure 4:

	China	South Korea	Japan	USA	EU
Approximate number of 5G base stations	2,937,000	217,000	146,000	100,000	356,000
Total country population	1,425,700,000	51,800,000	123,300,000	334,000,000	448,400,000
5G base stations per 100,000 inhabitants	206	419	118	30	79
Indicative 5G subscribers	689,200,000	28,000,000	14,190,000	79,000,000	143,000,000
Indicative 5G subscribers per 100,000 inhabitants	48,341	54,054	11,509	23,653	31,891

Source: European 5G observatory (https://5gobservatory.eu/observatory-overview/interactive-5g-scoreboard/), data on BS collected between July 2022 and July 2023

As far as investment trends are concerned, significant investments are still needed to meet the Connectivity Targets and a few points may deserve further attention. A study for the EC has shown that overall, the financial means for network investments are generally available: "(…) *financial markets have been in the last 10 years massively fuelled by liquidities, mainly coming from Central Banks expansionary policies (e.g., FED and ECB) driven by low interest*

rates, combined with a global saving glut. Institutional investors (insurance companies, pension funds), asset management companies but also commercial banks have thus been looking for long term investments with attractive "risk-return" patterns"[23.] Furthermore, this study sets out that investments in telecommunications networks have an attractive risk profile for investors: "*For investors, Telecoms are today very privileged infrastructure assets, seen as a 4th utility (…). Telecoms have a limited correlation to economic downturns*".[24]

While the conditions in the financial markets have changed in the last two years, the main conclusions of the study remain valid. Generally, there is sufficient capital available as e.g. pension funds are looking for low risk and long-term investment. A study from WIK-Consult estimates the investments for FTTH and 5G roll-out needed to achieve the Digital Decade Connectivity Targets.[25] Depending on the scenario, the total costs vary between EUR 146 - 174 bn with subsidy requirements between EUR 32.7 – 43 bn. Considering that the existing EU funds amount to around EUR 19 bn, it can be inferred that the remaining subsidies needed to achieve the Digital Decade Connectivity Targets are up to a maximum of (approximately) EUR 14-24 bn.

Thus, rather than focusing on the absolute investments needed to achieve the Digital Decade Connectivity Targets, BEREC believes it would be more appropriate to address these *remaining* investments needed and quantify them, a perspective which is lacking in the White Paper. This holds considering that the majority of the necessary investment is already covered by the private sector [26].

In this context, it seems that the main obstacle to the roll-out of fibre and 5G networks is therefore not the lack of financial resources. BEREC has identified the following factors as

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[23]Visionary Analytics, CBO Consulting, Idate (13 June 2022), https://digital-strategy.ec.europa.eu/en/library/study-investing-local-and-regional-gigabit-broadband-deployment-opportunities-and-challenges-market, S. 16. However, it should be noted that this may have been offset to some extent given the increase in interest rates since then.

[24] Ibid, p. 18.

[25] https://digital-strategy.ec.europa.eu/en/library/investment-and-funding-needs-digital-decade-connectivity-targets; for the key points see also https://www.wik.org/fileadmin/user_upload/Unternehmen/Veroeffentlichungen/Kurzstudien/2023/WIK_Kurzstudie_Fair-Share.pdf, p. 11.

[26] For Germany, a study conducted by WIK-Consult on behalf of the Federal Ministry for Digital and Transport shows that +90% of all fibre access lines can be deployed with private investments, https://bmdv.bund.de/DE/Themen/Digitales/Breitbandausbau/Potenzialanalyse/potenzialanalyse.html#map_deutschland .

important obstacles – if not the most important in many Member States – hampering the roll-out of VHCN: [27]

- Administrative processes (e.g. for building permits, roadwork authorisations and subsidy granting),
- the availability of information (e.g. to municipalities, investors and operators),
- scarcity of construction capacity,
- and required real estate.,
- lack of consumer demand (e.g. when current infrastructure suffices the needs of consumers),

It is essential to gather a robust, complete and updated set of information also on such aspects and duly analyse it, in order to properly address any potential regulatory impact of each dimension: removing such obstacles is expected indeed to attract further capital and reduce the risk premium for investors in telecoms networks.

Regarding the financial situation of the sector, while the White Paper points to a lower ARPU in the EU relative to the US, Japan or South Korea, it does not provide an explanation for these ARPU differences, but rather infers that this has led to declining ROCE.

BEREC notes that a lower ARPU may also reflect "stronger" competition that end-users benefit from. The OECD Report "Financing broadband networks of the future"[28] (hereinafter: OECD Report) states: "*The higher-inflation adjusted ARPU figures observed in the United States and Canada may be explained by several factors. Within the OECD area, prices for communication services for consumers and businesses are comparatively high in the United States and Canada which may reflect lower levels of competition in the market, most acute in rural and remote areas*". Furthermore it stipulates *"…the declining ARPU in Europe may be a result of increased levels of competition, with operators and other players striving to offer enhanced consumer value, particularly in terms of data*".

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[27]BoR (23) 131d, BEREC response to the European Commission's Exploratory Consultation on the future of the electronic communications sector and its infrastructure Annex to complement section 4 of the BEREC response, 19.5.2023, see: https://www.berec.europa.eu/system/files/2023-05/BoR%20%2823%29%20131d%20Annex%20to%20Section%204.pdf, p. 6.

[28] OECD (2024), "Financing broadband networks of the future", OECD Digital Economy Papers, No. 365, OECD Publishing, Paris, https://doi.org/10.1787/eafc728b-en.

In addition, the White Paper associates the capacity of the EU to carry out the investments needed and the above outlined financial situation of the electronic communications sector and stresses that clear business cases for profitability and higher margins are identified as requirements for mobilising private investments, as well as the reduced fragmentation of the electronic communications market, which allows for the developments of assets with sufficient scale.

On this matter, it must be noted that these investments do not depend only on scale, but they also depend, considering the coverage specificities in each Member State, on the capacity: i) of obtaining financing (mechanisms), ii) of promoting shared investment among different stakeholders and /or iii) to attract new entrants, where the operators in the market cannot finance potentially profitable investments. It should be clear that the presence of new entrants will depend on the existence of a competitive level playing field and demand, which does not seem to be adequately supported in the White Paper.

In BEREC's view, competition remains the most powerful tool to ensure that operators have incentives to invest and innovate.

Relatedly, the OECD Report shows that there may be various reasons why financial indicators differ between countries.[29] Thus, BEREC considers that it is necessary to take a close look at the grounds for the differences and develop such indicators over time to avoid hasty conclusions.

In conclusion, BEREC considers it is necessary to continue preserving competition in the electronic communications sector. While competitive dynamics have been properly working so far, it is important to keep the markets open to new entrants also in light of its progressively expanding scope (i.e. for instance new players, traditional players changing nature etc.) to the benefit of European end-users, innovation and adapting to the digital transformation.

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[29] "*As for overall revenues, regional differences in EBITDA margins may result from different market characteristics. For example, lower levels of competition may result in higher prices, in turn resulting in higher margins. In addition, factors like firm efficiency, cost structures and other operational costs directly influence EBITDA margins and may play a role in explaining regional differences.*"

3. Proposals for the future of the digital networks

3.1. The Scope of the framework

BEREC agrees with the EC that it is appropriate to evaluate the scope of the regulatory framework in order to ensure that, in light of the technical and market developments, it is still fit for purpose and sectoral objectives are not jeopardised. However, any changes in this respect would have to be justified and based on a comprehensive impact assessment.

BEREC supports the reassessment of the definitions and categories of ECN-ECS to ensure that those are still fit for purpose and suitable to ensure legal certainty. Some of the technical and market developments that may impact on the current scope and definitions include the evolution towards cloud-based networks, the effects of CDN, CAPs or operating system (OS) on the provision of ECN-ECS – including the activities of conveyance of signals that some of such actors carry out by providing services to other stakeholders - and open internet, as well as the evolution of ICS.

BEREC believes that it makes sense to assess the role of such players and the impact they have on the ECN-ECS markets, for instance in relation to their investment activities and has identified actual or potential issues having an impact on the ECS-ECN markets and providers which deserve to be further analysed and assessed.[30]

Indeed, recent technological developments and specific services and networks provided by large CAPs (and in particular by OS providers) may impact ECN-ECS providers in relation to providing access services and the operation of the network. For instance, operators might not have full control over their network slicing where the OS provider determines the access to the slice in relation to the device and the application on the device. Other practices of OS providers may relate to determining standards concerning the slicing traffic identification, where the telecoms operators may not be able to fully ensure that the traffic is correctly

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[30] For further details please see BoR (24) 51, Draft BEREC Report on the entry of large content and application providers into the markets for electronic communications networks and services, 7.3.2024, see: https://www.berec.europa.eu/en/document-categories/berec/reports/draft-berec-report-on-the-entry-of-large-content-and-application-providers-into-the-markets-for-electronic-communications-networks-and-services and BoR (22) 167, BEREC Report on the Internet Ecosystem, 12.12.2022, see: https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-the-internet-ecosystem
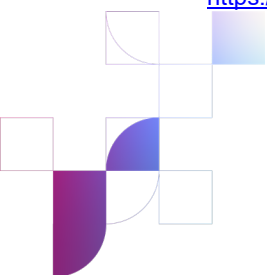
separated into the defined slices, or difficulties of MVNOs and small MNOs in setting up functionalities of the devices (e.g. APN-related services, VoLTE, VoWiFi) or in configuring the network profile when eSIMs/iSIMs are used. Besides impacting the business of ECN-ECS, more fundamentally, those practices undermine the capacity of end-users to choose their devices and services. BEREC notes that these practices of OS provider might be addressed to some extent under the Digital Markets Act.[31]

Regarding the possibility to extend the regulatory provisions to cover further obligations on providers of NI-ICS, the White Paper does not provide any details in relation to any possible future developments, especially in an end-user protection perspective. The current relevant NRAs' powers under the EECC include symmetric and asymmetric regulation and extend to market monitoring, information requests and protection of end-users' rights (including non-discrimination, obligations for information in contracts, transparency obligations, as well as information obligations related to quality of service).[32] However, at this point in time, it may be worth looking further into this matter and analyse the position of the NI-ICS providers and assess the current state of the market, including with a view to having consistent end-user protection guarantees in the usage of both NB-ICS and NI-ICS. The impact of other sector regulations directly affecting providers of some NI-ICS may be also worth considering.

The White Paper also addresses IP interconnection in the context of its scope-related proposals.

On this matter, the White Paper indicates that the contractual relations between market actors "*generally function well and so do the markets for transit and peering*". This is basically supported by BEREC's previous reports on IP interconnection[33] and by the WIK report

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[31] According to Art. 6 (6) DMA designated gatekeeper (providing e.g. OS) may not restrict technically or otherwise the ability of end users to switch internet access services.

[32] See also BoR (21) 85, BEREC Report on the interplay between the EECC and the EC's proposal for a Digital Markets Act concerning number-independent interpersonal communication services, 10.6.2021, see: https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-the-interplay-between-the-eecc-and-the-ecs-proposal-for-a-digital-markets-act-concerning-number-independent-interpersonal-communication-services

[33] BoR (12) 130, An assessment of IP interconnection in the context of Net Neutrality, 6.12.2012, see: https://www.berec.europa.eu/en/document-categories/berec/reports/an-assessment-of-ip-interconnection-in-the-context-of-net-neutrality and BoR (17) 184, BEREC Report on IP-Interconnection practices in the Context of Net Neutrality, 5.10.2017, see: https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-ip-interconnection-practices-in-the-context-of-net-neutrality
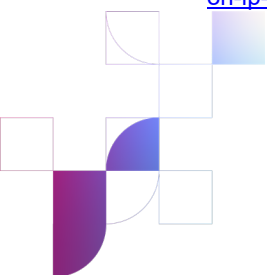
published in 2022[34]. In particular, the White Paper refers to the charging mechanism of Bill & Keep where there are no wholesale payments. Furthermore, the White Paper refers to WIK's finding of a cooperative interaction between CAPs and ISPs.

BEREC recalls that Bill & Keep emerged in the market process and that costs are typically covered and paid for by ISPs' customers implying that there is no evidence of "free-riding"[35] In any case, BEREC will share its views on the matter upon conclusion of its current project about the IP interconnection ecosystem (to be published for public consultation in June 2024 and finally adopted for publication in December 2024).

As regards issues that have emerged in a few national markets, the current regulatory framework provides some means to handle problems in areas which are governed by commercial agreements - like IP interconnection. These means include NRAs' capacity to settle disputes between ECN-ECS providers and other undertakings benefitting from access or interconnection obligations for the purpose of providing publicly available electronic communications services, and the NRAs' power to collect data from undertakings active in sectors that are closely related to the electronic communications. In addition, the concept of "non-circumvention" enshrined in the OI Regulation and the BEREC Guidelines provides an available tool to address issues in the IP interconnection market.

Nevertheless, it would be useful to further clarify the role of NRAs - that have an in-depth knowledge of national markets - for settling any disputes that may arise in the future between ISPs and CAPs, based on the IP-interconnection principles which are generally agreed and applied in the market, as well as for regularly monitoring the markets via data collection activities.

BEREC is open to take on a role in this field in the future, in order to foster consistent practices throughout the Union.

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[34] https://www.bundesnetzagentur.de/EN/Areas/Telecommunications/Companies/Digitisation/Peering/download.pdf?__blob=publicationFile&v=1

[35] BoR (22) 137, BEREC preliminary assessment of the underlying assumptions of payments from large CAPs to ISPs , 7.10.2022, see: https://www.berec.europa.eu/system/files/2022-10/BEREC%20BoR%20%2822%29%20137%20BEREC_preliminary-assessment-payments-CAPs-to-ISPs_0.pdf

3.2. The objectives of the framework

Concerning the sectoral objectives, BEREC is of the view that it is a prerogative of the competent EU Institutions to consider expanding them to take into account technological and market changes.

Nevertheless, any review of the current sectoral objectives would need to be justified and consideration given to whether any newly proposed objectives are consistent with and have an equal standing with other objectives, as it has been the case for the current objectives defined by the EU legislator in 2018.

The newly proposed objectives of industrial competitiveness and economic security outlined in the White Paper, should therefore be not in contrast with the current regulatory objectives in order not to trigger a trade-off for NRAs in their regulatory decisions. Especially, European competitiveness shall be fostered across the economic fabric, without being constrained to predefined undertakings, and without foregoing or deprioritising the other goals enshrined in the electronic communications' legislative framework.

BEREC believes that there is likely to be a link between fostering a bigger operational scale for operators and triggering consolidation dynamics and is therefore of the view that competitiveness should stem from competition. Only competition can promote digital infrastructure deployment, as the main drivers for the undertakings' operational scale lie outside electronic communications regulation.

The emphasis put on scale by the White Paper is likely to result in less choice and lower quality, ultimately leading to higher prices as competitive pressure decreases. Moreover, without competitive pressure, there is no guarantee for investments to obtain a competitive advantage, thus, Europe could also lose out on promoting VHCN deployment. This could have an especially negative impact for smaller and less-densely populated countries, ultimately hurting both the consumer and the competitiveness of the European economy.

All in all, in BEREC's view, the paradigm shift outlined in the White Paper in terms of sectoral goals and its likely regulatory consequences can be considered as neither justified (on the basis of any failure of the current framework, whose driving goals have been functioning very well in leading the NRAs' regulatory activities), nor constructive (with a view to preserving competition, investment in VHCN and, in turns, end users' benefit).

On the other hand, BEREC supports including the environmental sustainability as one of the objectives of the regulatory framework, as this would support the green transition of the sector. NRAs are indeed well placed to contribute to this overarching goal by different means such as defining and collecting relevant EU sustainability indicators. Sustainability also plays a role in relation to topics such as infrastructure sharing or copper switch-off. Formalising such dimension into the sectoral framework would help meeting the challenges ahead, including contributing to measuring the carbon impact of electronic communications networks and digital technologies[36].

3.3. The effectiveness of the framework in fostering connectivity

The EECC has brought to the framework a new objective driving the NRAs' intervention: ensuring connectivity and the widespread availability and take-up of VHCN[37]. In addition to the already existing robust regulation framing co-investment, including asymmetric and symmetric instruments, the EECC has entrusted NRAs with new regulatory tools to foster connectivity, such as mechanisms related to commitments, wholesale-only undertakings and commercial agreements review. Several NRAs have already implemented those tools and have drawn first experiences from them. It could well be that most of the objectives identified in the White Paper can be achieved via measures adopted under the current framework, thus removing the requirement for significant adaptations.

BEREC recognizes the importance of following how these measures evolve and assessing their impact on the promotion of the deployment of VHCN. This year, BEREC started conducting an activity which is meant to ensure an exchange of the experience gained with the application of these provisions, including on commitments (Article 79 of the EECC). It is BEREC's aim, with the benefit of hindsight, to discuss the perceived advantages and disadvantages with the NRAs and the operators. To that end, BEREC is seeking the operator's experiences in a series of workshops. A more detailed description of this workstream, as well as of the deliverables envisaged for this activity line, can be found in the BEREC Work

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[36] For further insights, see BEREC Report on Sustainability: Assessing BEREC's contribution to limiting the impact of the digital sector on the environment and the BEREC and BEREC Report on Sustainability Indicators for Electronic Communications Networks and Services[37] EECC, Article 3(2)(d).
[37] EECC, Article 3(2)(d).

Programme 2024[38]. For now, BEREC can confirm that the provisions of Articles 76, 79 and 80 of the EECC have been applied in a handful of countries in Europe and not only in the wholesale markets underlying the broadband internet access services, where we understand that the rollout of broadband was the main motivation for their introduction in the first place. IT has been the only country to date where the co-investments procedure as in Article 76 of the EECC has been applied, with the regulators in DK, FI and FR having made use of the commitments made binding not to impose traditional SMP obligations. The commitments procedure has been successfully applied in DK for the broadband markets and in FI and FR for the broadcasting market. As regards the wholesale-only provisions, BEREC understands that only DK has been using the provisions of Article 80 of the EECC so far.

Based on evidence collected to date, some general conclusions can be drawn: (i) the SMP obligations were the basis/played a role in shaping the commercial agreements and commitments, (ii) the process was lengthy and complex and (iii) predictability was one of the key elements to be achieved (e.g. IT and FR) together with access to passive infrastructure (e.g. IT and IE). For incumbents, commercial agreements were in some cases a tool to provide flexibility for technological change (e.g. CY and FI), to simplify the wholesale offer (e.g. CY) or to allow them to be the first movers to be able to propose reasonable access conditions (e.g. FR). For access seekers, the focus seemed to be on resolving asymmetries between parts that create information and opportunity cost problems (e.g. in IT and FI cases -). In addition, BEREC learned that NRAs should ensure that remedies work before removing SMP remedies (e.g. IT), NRAs should make commercial offers binding (e.g. AT), or commercial agreements have the problem of excluding operators as they do not meet the volumes required by incumbents.

In general terms, besides asymmetric and symmetric regulation, including the provisions of Article 61(3) of the EECC, the commitments procedure seems to have been, so far, more broadly used in practice than the co-investment and wholesale-only approaches.

BEREC is already working on assessing the functioning of the current framework in a review perspective; in this respect, BEREC has already issued and will further provide its inputs as

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[38] Item 1.2. - https://www.berec.europa.eu/system/files/2023-12/Work-Programme-2024.pdf

envisaged by the EECC on a number of matters, including the functioning of the above-mentioned provisions.

3.4. General Authorization

The proposals in relation to general authorization (GA) echo the proposals already tabled within the legislative process leading to the EECC, and back in 2013, within the EC's proposal for a Telecom Single Market regulation, now addressing a "One-Stop-Shop" mechanism from the perspective of the nature of the service at stake, i.e., core network services.

Based on the available information, BEREC raises some matters of concern around the following areas: i) the nature and the perimeter of the concept at stake of "core network services"; ii) the actual problems that the proposals are meant to address and their origin; iii) the introduction of the Country-of-Origin approach and its impact on electronic communications sector regulation.

Firstly, as already mentioned, BEREC notes that the scope of "core networks" and "core network services" is not defined in the White Paper. It is, therefore, unclear whether the definitions encompass only the virtualized layer of the network or if the underlying physical network would also be included.

Secondly, it seems that the White Paper assumes that should the authorisation conditions be the same across Member States, the traditional network operators would respond to the incentive to integrate network functionalities in cloud centres and would therefore invest and progressively reach a pan-European scale of activity for network provision.

While the White Paper does not provide any evidence for such a scenario, the most recent BEREC information collection exercises show that the GA regime in the EU is perceived to

function well in regulating market entry (being identified as a best practice, e.g. most recently in the BEREC report on submarine cables[39]).

The technological dimension of the issue at stake, i.e. the alleged link between technological trends and cross-border investment opportunities, therefore appears overestimated and the authorisation matter seems to arise rather in relation to the objective of ensuring an equal treatment of traditional and cloud service providers (all under the same and more simplified authorisation regime, in the EC's level-playing field perspective).

On the other hand, the EC does recognise that key issues relating to market entry stem from national legislation beyond electronic communications law and that authorisation regimes, especially for local access and retail services, should be kept at a national level so as to ensure proximity to end-users and meeting the needs of local markets.

The alleged inconsistencies among Member States have proven to fall within the scope of Member States' room of manoeuvre when implementing EU legislation, and most of them are either addressed by the EECC and the relevant notification template adopted by BEREC in 2019, or stemming from other national legislation, e.g. the requirement of administrative tax number by the Tax Administration.

All in all, the problem identified by the EC seems to be rather relating to the appropriate scope of the framework and level-playing field, rather than an actual issue stemming from different authorisation-related requirements throughout the Union.

Turning to outside the ECN-ECS legislative framework, BEREC agrees with the EC's observation of the differences in national security-related obligations. Some Member States for example require that the critical network components be located or can be relocated within the country in question. Some of such aspects require a thorough assessment because they could pose a risk to digital sovereignty in the current security context.

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[39] BoR (24) 85, BEREC Report on the general authorisation and related frameworks for international submarine connectivity, 6.6.2024, see: https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-the-general-authorisation-and-related-frameworks-for-international-submarine-connectivity
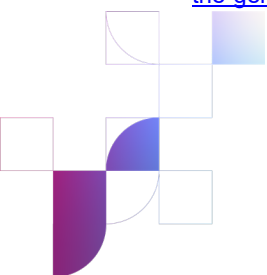
Finally, as to the "Country-of-Origin" principle applied so far in the context of information society and media services provision, it is showing its limits especially in terms of its capacity to ensure suitable end-user protection, and its implementation should be monitored with attention also in the digital markets; therefore, a much deeper analysis is needed before considering its implementation.

The Country-of-Origin approach presents indeed normative complexities in terms of identifying the applicable legal framework and possible forum shopping practices, as well as in terms of NRAs' capacity to protect end-users and to rely on adequate administrative charges (pursuant to Article 9 of the EECC). This is already being experienced in relation to the implementation of such an approach in the field of digital services. Operators will indeed tend to set up their business in countries where the requirements are lower and the procedures faster, which would be problematic e.g., regarding the very costly network resiliency requirements. Dispute resolution could also be problematic given the differences between national courts.

The current Country-of-Destination approach has instead proven all its fitness in the electronic communications sector, where it has allowed to effectively handle problems in the markets where they arise (network access, competition issues, end-user protection).

As a matter of fact, for the time being, core network providers are also present in the access network. Therefore, according to the White Paper, they would be also subject to national jurisdiction. Such a disaggregated model where the core network could be managed from another country subject only to that country's jurisdiction, might mainly benefit players operating only in the virtual layer. Furthermore, defining diverse jurisdiction approaches to certain parts of the network, subject to the technological solution adopted, would also risk creating legal uncertainty and hindering the technology neutrality principle.

If the goal is to allow ECN-ECS providers to gain cloud-like scalability to deploy pan-European services as well as enable the 3C Network, BEREC believes that ensuring interoperability between different cloud infrastructures and developing the necessary standards and measures to ensure openness would constitute more relevant and suitable measures. Common European standards should therefore be developed to guide the industry, so as to foster regulatory and technological convergence, increase legal certainty and reduce compliance costs for the industry, in particular for small players. The adoption of standards at European regional level should also lead to competitiveness gains, to the provision of

harmonised pan-European services and to greater legal certainty. Another approach could be that of developing soft law principles and guidelines for companies, as well as European certification instruments for network equipment or cloud, edge, AI tools, in line with the Cybersecurity Act.

3.5. Radio Spectrum

BEREC has carefully considered the discussion points on spectrum raised in the White Paper, , which prompted reflections from various perspectives. For example, BEREC response to the Exploratory Consultation also sets out concerns around the impact on smaller market players of a more integrated approach on spectrum, amongst other things.[40]

Overall, BEREC believes that it can positively contribute to future spectrum strategies that recognise the significant differences in demography and geography between Member States in the European Union, as well as the benefits that the harmonised use of radio spectrum can lead to for Europe and European citizens.

For example, BEREC has contributed and continues to contribute positively to the harmonised wireless regulation in its competence in Europe[41], and looks forward to providing future expert Opinion(s), Common Positions, Best Practice reports in many relevant areas, such as in support of the EC's latest initiative on the methodology for the mapping of QoS coverage on connectivity indicators for the Digital Decade Policy Programme.

BEREC will also continue to work collaboratively with RSPG to help the EC design and implement policies for the most efficient use of spectrum in the Union. BEREC considers that new strategies will ultimately have to be designed having regard to the fact that Member States will need to continue to play a pivotal role in spectrum management in order to properly address the national circumstances. In this respect, any future spectrum authorisation process (even if aimed at promoting pan-EU networks in case of such policy decision by MSs) should acknowledge the specificities of each Member State.

However, as in other sections of the White Paper, some of the ideas around spectrum are lacking a sound supporting evidence and sufficient details to be properly assessed.

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[40] BoR (23) 131, BEREC input to the EC's exploratory consultation on the future of the electronics communications sector and its infrastructure, 19.5.2023., see: https://www.berec.europa.eu/en/document-categories/berec/others/berec-input-to-the-ecs-exploratory-consultation-on-the-future-of-the-electronics-communications-sector-and-its-infrastructure

[41] Numerous BEREC publications can be cited here covering everything from infrastructure sharing, feasibility studies of coverage information on 5G deployments, cloudification /virtualization / softwarization studies, Open RAN workshop, to wholesale mobile connectivity, trends and issues for emerging mobile technologies and deployments

As to the EC's **claim about delayed 5G deployments in Europe**, BEREC considers that the EC fails to analyse the influencing factors in detail and jumps hastily to conclusions, as follows:

First, in most European countries the rollout of 5G began immediately after the award of one of the pioneer bands (either the 3600 MHz or the 700 MHz band) was completed. In many countries, a nationwide coverage with 5G was achieved very quickly using various rollout options (e.g. rollout of pioneer bands, DSS, 5G non-stand alone, 5G stand-alone). Due to the different rollout strategies in different bands country comparisons should be treated with caution (especially in an early phase of the introduction of 5G). Countries in which the early 5G rollout was based on the 3600 MHz band benefit from very high data rates but with lower coverage levels. Whereas in other countries where dynamic spectrum sharing (DSS) in LTE bands were used for the initial 5G rollout a population coverage comparable to 4G was reached very quickly, but without any extra capacity.

Second, the demand side (prices and demand for 5G services) play an even more important role for the 5G take up than the timing of the awards and any national differences in the award procedures. BEREC contends that slow pace of 4G core replacement with 5G stand-alone core architecture in many countries has less to do with the timing of the award / frequency assignment processes, but more to do with the **delayed availability of the 5G SA technology (especially of the smartphones)**. 5G SA faces several difficulties essentially unrelated to national frequency assignment processes, namely implementation of a 5G core, insufficient 5G RAN coverage to support control plane signalling and uplink traffic, insufficient 5G capacity which will require carrier aggregation and spectrum refarming and SA-capable devices. 5G non stand-alone deployments in the 3.5 GHz added considerable capacity, however, 5G SA deployment may enable specific services like the guaranteed bandwidth for fixed wireless access or other niche services and applications like gaming.

Third, there are likely to be many other parameters that might explain the take-up rate of 5G including from the supply side (e.g. lack of competition between networks to rollout, replacement effects driven by strategic security measures, absence of capacity bottlenecks in networks other than in dense urban locations e.g. stadia), litigation by bidders delaying efficient awards, military use of bands, or other legacy issues requiring transitioning or protections to be worked out before rollout (e.g. radars).

BEREC considers that delays in the roll out of the pioneer bands in some Member States cannot be considered as a general statement for the entire European landscape. As set out above, many Member States successfully awarded spectrum rights in line with the pre-defined timeframe and in line with the market demands. Moreover, it should also be noted that some spectrum awards and roll-outs were impacted by the COVID-19 pandemic, which resulted in some delay.

As a result, BEREC does not share the notion that the European Union is lagging behind its international competitors on the uptake of 5G. BEREC also emphasises that care needs to be exercised when making regional comparisons because reporting of rollout in regions may be different, absent a common definition of "5G coverage". In this regard, BEREC supports the EC's proposed workstream on mapping QoS coverage on indicators for the Digital Decade Policy Programme, but also recalls operators' own views on the wide variety of observed capabilities of 5G deployed in their networks.[42]

In relation to **payments (and claimed overpayments)** made in past spectrum auctions, and the claim about artificial national restrictions driving to spectrum scarcity, a preliminary analysis of recent award results does not seem to support this narrative for the following reasons:

First, as in any well-functioning market mechanism, prices in spectrum auctions result from supply and demand. The demand for spectrum is derived from the long-term demand for mobile broadband services. The prices paid reflect the degree of scarcity of the resource with respect to the demand. Therefore, the most important measure to dampen spectrum prices is to ensure a sufficient supply of spectrum for ECS services (especially in low and mid bands) in a timely manner. Excessive strategic bids are one of several problems that can occur in spectrum auctions. These can be prevented by well-designed auction rules. BEREC believes that the vast majority of 5G auctions in Europe have been conducted based on tried and tested auction formats (which are also used outside Europe) and well-designed auction rules so that the prices bid should reflect "true" market value.

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[42] See also Annex 4 of [BoR (23) 164 on GLs on Very High Capacity Networks (2023)](#)

Second, competent authorities ensure that spectrum is awarded on a service and technology-neutral basis. The choice of service and technology is a decision made by the operators and they make bids according to their business case.[43]

Third, a preliminary examination of results outside Europe shows that in some countries higher prices are paid for 5G spectrum, though it is difficult to draw direct comparisons given the treatment of spectrum in some jurisdictions (perpetual licences or state interventions). However, BEREC's preliminary view of the results of recent award processes in Europe seems to support that the prices paid (on a per MHz per population basis) are broadly consistent, whereas one might expect there to be wide variations in prices if overpayments were an issue.[44]

Turning next to the **relevant actions** which the EC proposes: (i) EU-level planning of sufficient spectrum for future use cases, (ii) strengthening EU level coordination of auction timing, and (iii) considering more uniform spectrum authorisation landscape, BEREC's views on each proposal enumerated (i), (ii) and (iii) is that in relation to (i) this seems sensible because planning for future needs and providing information on the availability of spectrum adds to predictability for the market, but this is already common practice in Europe (ii) coordinating timing is provided for in Article 53 of EECC already, and has proven to be helpful in cases of market demand[45] and (iii) BEREC has reservations and comments as set out immediately below.

BEREC considers the timely provision of adequate spectrum for ECS services is the most important measure. This should be followed by a synchronised award of key bands in order to exploit economies of scale, when there is sufficient demand, including through joint selections

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[43] The White Paper seems to suggest the driverless cars service / use case requires more centralised thinking towards spectrum awards (presumably because driverless vehicles would cross borders and need excellent handover or roaming connectivity between networks). BEREC, however, warns against picking services and use cases. Picking services and uses cases can negatively impact the market if the service or relevant technology becomes outmoded; the opportunity costs can be large. There are other issues associated with using such a hypothetical example, as the network topology is not set out, so it is unclear why a centralised spectrum policy tool would be warranted over any other existing tool.

[44] A study for the EC in 2023 concludes that where spectrum is timely auctioned, rollout to a large percentage of the population follows rapidly. BEREC also sees this result in practice in a wide variety of awards in Europe.

[45] Although Article 53 called for at least 1GHz to be made available at 26GHz, market demand across the EU was varied with limited interest in some countries until much more recently than defined date 31 December 2020. Therefore, enshrining a common date for availability of a band should be based on pragmatism and practical experience and market circumstances.

processes as already permitted under Article 37 of EECC. In particular, the timely provision of spectrum for 6G on a harmonized basis in terms of use and a common timetable for predictable availability can be an essential input for its success, as it can for the success of any mobile technology.

In this context, BEREC considers that well-designed awards are based on award objectives and take national circumstances (competition, coverage objectives, etc.) into account, since to not do so would be an obstacle to an efficient award. It also underlines the opportunity to consider environmental sustainability as part of a uniform spectrum authorisation policy, for instance by developing uniform environmental indicators for new technologies and deployment schemes (e.g. for 6G). On a whole, national circumstances significantly limit the possibilities for complete uniformity or standardisation of selection and award procedures across multiple Member States at the same time.

Networks evolve towards newer mobile generations, though a mix of new spectrum and re-use of existing spectrum and closure of older technologies.

An advantage of multiband auctions is that bidders can obtain a package of frequencies on several bands and, as a result, coverage/development obligations can be more easily to specific needs. Consequently, it may be more convenient for some administrations to hold multiband auctions, including licences for new spectrum (e.g., for 6G) as well where licenses are expiring. Alternatively, this could not happen in the case of a joint auction at the EU level, due to the fact licence commencement dates, as well as the period for which they were granted are not uniform between Member States.

Because of the benefits of access to a portfolio of different spectrum holdings, centralised design/selection for "new" spectrum could in fact prove counterproductive for operators' technological progress.

Furthermore, an authorisation process across the entirety of the EU might be delayed (and services hindered) because of an appeal process in one Member State. Another aspect in that regard might be unresolved border-coordination with non-EU countries, where one missing agreement might delay the availability of spectrum in the entire region. This creates significant

downside risks. Furthermore, BEREC recalls the RSPG report on Efficient Awards and Efficient Use of Spectrum and its conclusion that there is no one-size-fits-all approach to spectrum award procedures and considers this remains valid today.[46]

The White Paper seems to suggest a coordinated switch-off of networks in order to coordinate the roll-out of new technologies across Member States, with switch-off of 2G and 3G networks being touted as an example. BEREC notes that in some countries 3G networks are already turned off, and operators have planned 2G switch-off already in 2025 but the timing of phaseout is a matter for market participants. A harmonized switch-off could hamper the efficient use of spectrum and technological development in countries with early adapters. The markets' approach to flexibly migrate to newer technologies will also help direct efficient investment towards forward-looking technologies, e.g. reaching the Digital Decade Connectivity Targets for Gigabit connectivity. Coordinated switch-off should therefore be assessed with such aspects in mind, including those as reported by BEREC in 2023[47].

As regards the suggested proposal set out in the **White Paper to apply an Art 32-like notification mechanism**, BEREC's preliminary views are that this proposal introduces a significant change to the current process and could remove scope for Member States to adapt their spectrum management decisions to national circumstances. The proposal also seems to add additional layers of bureaucracy over and above the Peer Review mechanism, which is voluntary for Member States and also involves reporting by RSPG.. In such context, the awarding authorities were always able to explain national circumstances, award objectives and reasons for the particular design. In addition, BEREC considers that an Art 32 like notification has several risks such as that of delaying awards, which in turn can further delay efficient rollout(s). This is important because a study for the EC (2023) indicates that one of the powerful levers associated with good 5G rollout is i) early spectrum awards, and the second lever is ii) lower consumer prices. Also, a mechanism as such risks having timing-related impact, while the timeframe for the harmonised procedures will not be reduced, only

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[46] RSPG 16-004, RSPG Report on Efficient Awards and Efficient Use of Spectrum, 24.2.2016, see: https://radio-spectrum-policy-group.ec.europa.eu/document/download/705ba412-9c81-473a-9fa2-67f424f87773_en?filename=RSPG16-004final-Efficient_Awards_report.pdf
[47] BoR (23) 204, BEREC report on 2G/3G phaseout practices and challenges, 7.12.2024, see: https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-2g3g-phaseout-practices-and-challenges

the procedure itself ending up being longer. While recognising that market conditions in the Member States are not homogeneous, BEREC points out that it is not possible to achieve equivalent conditions, as different approaches are needed to achieve the same objectives in different circumstances. Lastly, an Article 32-like procedure risks creating uncertainty for industry, potential spectrum bidders, and their advisors, making it more difficult to value spectrum and ultimately impacting on the efficiency of awards (even absent the EC power to veto).

With regard to the **more specific discussion points in the EC White Paper**,
namely, the discussion regarding the inclusion of satellite networks, there may be complexities in relation to pan-European satellite selection and authorisation processes, as evidenced with the EU-led pan-European selection process and award for Mobile Satellite Services (MSS) at 2 GHz in 2009. Complexities may include incorporating national circumstances into the award, so that all Member States can benefit with equitable access to spectrum and satellite services. For now, absent of any concrete proposals BEREC does not elaborate on this issue in detail. Also, the so far untried tools in the EECC (such as joint authorisation process of Article 37) may already prove useful in the future. As a result, interested stakeholders may bring forward joint-authorisation proposals, where needed, to the attention of NRAs. BEREC would therefore consider it is premature to re-invent the regulatory environment to accommodate an EU-led pan-European selection process based on the satellite service.

BEREC supports using the existing bodies, tools and technical harmonization approaches[48], as this has proven to be a good basis to enable comparable and scalable market development in the EU. In that regard, the proposal on reconsidering the role of the CEPT in EU decision making lacks sufficient information on the future plans. CEPT is working on mandates coming from the EC and the process is functional and flexible. It also sets incentives to non-EU countries to apply the same provisions which eliminates risks of harmful interference or border-coordination issues and increases the size of the European market.

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[48] BEREC does not have competence in the area of addressing harmful interference originating from third countries and does not consider this White Paper discussion point further here.

In addition, BEREC is of the view that the EC's scenario 6 proposals *"[for] …a more integrated governance at Union level for spectrum that would allow, where necessary, for greater harmonisation of spectrum authorisation processes and thereby create the conditions for market scale necessary for pan-EU operators to attain larger investment capacity"* overlooks the relevant provisions of the current legislative framework which allow the creation of Pan-EU operators, should operators, in fact, wish to take this particular direction. It should be noted at this stage that spectrum awards are not the only means to foster the development of pan-European operators : the example of the international M2M market shows that pan-European services on specific markets are demanded and offered, and that the obstacles faced by the providers on these markets are not spectrum related but more associated with wholesale access markets or roaming.

In summary, the the White Paper discussion points seem to set out proposals that would put market competition at risk, as smaller operators may not benefit from the changes proposed in the White Paper (also previously set out in the BEREC response to the exploratory consultation). Changes to the current framework may increase uncertainty for smaller operators whose needs may be underserved by "more integrated governance" on spectrum. This, in turn, will have effects on consumers (since competition is one of the main reasons for price decreases and new iinvations). BEREC therefore considers that (1) pan-European awards may not take into account national or regional circumstances and can therefore result in inefficient use of spectrum, and (2) there are other means than spectrum awards to incentivise operators to invest in mobile networks; reducing deployment costs, for example through streamlined permit granted processes, and network sharing can be a useful lever.

3.6. Copper switch-off

BEREC agrees with the view expressed in the White Paper that copper switch-off may play an important role as an incentive in the achievement of the Digital Decade Connectivity Targets. Provided the relatively lower environmental cost of operations of fibre networks, copper switch-off may also help achieve some of the EU environmental targets by improving the energy efficiency of the networks. Moreover, BEREC considers that copper switch-off, if

managed well, could be a unique opportunity to boost retail competition, improve quality of services for end users, and potentially free up space in existing physical infrastructure for future use (such as ducts).

BEREC also shares the points identified by the EC, especially regarding the competition risks in the absence of sufficient coordination of all stakeholders, and the needs of end-users, especially the vulnerable ones. On the other hand, the copper switch-off process may have different effects on competition at infrastructure level, depending on the market situation, which should be carefully considered.

In terms of regulatory proposals, the White Paper refers to possible *"measures to accelerate copper switch-off (such as a target in 2030, aligned to the Digital Decade target for Gigabit connectivity, and support for copper-fibre switch-over from 2028)"*. The White Paper identifies a copper switch-off for 80% of the subscribers in the EU by 2028 and the remaining 20% by 2030 as appropriate milestones, however, without clarifying if these targets will be associated to a legal obligation added to the EECC, or whether they will rather be implemented through non-binding indicators, or whether any other form of implementation is envisaged.[49]

BEREC notes that a uniform and binding date for a copper switch-off across the EU would indeed be a strong intervention, deserving a sound justification, based on a clear market failure and robust supporting evidence for the need to introduce it. This should be demonstrated based on a precise analysis of the market situation, which is so far still to be conducted, taking into account potential counterarguments, such as the fact that the fibre rollout and take-up are clearly progressing (albeit at different speeds) and lower OPEX and lower energy consumption can also work as incentives for the incumbent to move to fibre.

Furthermore, BEREC wishes to stress that copper switch-off can contribute to foster VHCN deployment and uptake in practice, only if there is a technical possibility to speed up fibre deployments, which in some countries may not be the case. Article 81 of EECC and the Gigabit Recommendation envisages that NRAs should ensure the availability of alternative products

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[49] BEREC understands that the White paper is focusing on copper up to the building. However, there can also be in-building copper, which is tackled with the Gigabit infrastructure Act, when the buildings undergo major renovation works, BEREC believes that setting a copper switch-off date would hardly work as incentive for in-building networks.

provided over the VHCN of at least comparable quality to those that were provided over the legacy network until the switch off is completed.

In several countries, there are no re-usable ducts and digging is necessary to roll out fibre. In other countries, such deployments can only occur during a certain period of the year. Additionally, in some regions, especially rural ones, operators might not just have a business incentive to replace copper with fibre and customers might be left without fixed broadband access. For these countries, different incentives may be necessary, and setting a specific date should therefore consider these individual situations. Other countries (or regions within these countries) already deploy significant VHCN coax networks coverage, which do not seem to be considered by the White Paper[50]. In those regions, a comprehensive impact assessment should be performed before considering any stronger driving force for fibre roll-out, and a copper switch-off date recommendation would not result in a significant market change.

BEREC notes also that any such incentive should take into account all goals defined in the EECC. For this reason, when setting the targets, the EC should analyse any potential impact on end users, making sure for instance that everyone will have access to another access technology (which should be a VHCN). The particular needs of business end-users (in terms of offers, as well as in terms of proper coordination and timing of migration processes) should also be taken into account in this scenario.

In addition, targets should be defined such as not to negatively impact the regulated transition process (e.g. notice periods) following the application of the Gigabit Recommendation.

More generally, as mentioned in the Gigabit Recommendation, an appropriate alternative product of at least comparable quality providing access to the upgraded network infrastructure should be made available to access seekers. Such a situation should be established before the notice period starts, or sufficiently in advance of access obligations on the legacy network being lifted to allow for the decommissioning. Those conditions should be considered by the NRA in order to safeguard competition and the rights of end-users. As a result, any copper switch-off milestone should take this necessity into account.

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[50] These countries are BE, DE, NL, FR

A mandatory approach also raises other significant questions, for example how to deal with non-amortised parts of copper networks which are likely to remain in some countries by 2028 or 2030.

All in all, there seems to be many legal and operational uncertainties in such a mandatory scenario.

Based on all the aforementioned considerations, BEREC wishes to recommend an approach based on non-binding indicators, combined with the various measures suggested in the new Gigabit Recommendation. To note that the latter is still to be implemented, and thus it is still likely that it will provide useful incentives in the market in the next years. This approach would provide incentives to operators and NRAs to accelerate copper switch-off and migration, while at the same time allowing NRAs to adequately consider specific market, competition and deployment status of the specific country, thus also providing more legal certainty.

An implementation of the targets as a general objective (a non-legislative approach), monitored for example via non-binding indicators (e.g. percentage of migrated households), would create an incentive through reputational levers, but avoid the inflexibility associated with a legal obligation.

Lastly, regarding the definition of the targets in each country, BEREC would favour a flexible approach, as laid out in the new Gigabit Recommendation.

Although BEREC understands the appeal of a uniform approach due to its simplicity, this solution would clearly have very different effects across the EU and it would not be suitable to achieve the outcomes of the suggested measure.

One possibility to consider could be for each Member State to present guidelines for copper switch-off, outlining the specific national targets justified by the specific country conditions, in terms of competition, achieved VHCN coverage, and take-up status. The specific national target would be the result of a public consultation with the country's stakeholders and consumer associations.

3.7. Access regulation and Remedies

BEREC is of the view that the European electronic communications regulatory framework has worked well and can be broadly considered as a success in delivering adequate results to the market by the promotion of an effectively competitive environment and connectivity. Citizens in the EU benefit from high-quality services at affordable rates, VHCNs are being deployed at an accelerated pace, while wholesale access agreements and partnerships between operators are increasingly established based on commercial negotiations in a regulated framework. In short, public authorities have been adopting effective and proportionate ex-ante regulatory measures to move the telecom markets in Europe from the former state monopolies to markets in which competition can manifest itself effectively. However, these results are neither universal nor irreversible as market failures remain in some cases, depending on local circumstances, and require appropriate regulatory intervention.

Looking at the actual diverse contexts, there are geographical areas where the market, when left alone, cannot deliver the expected outcomes – either because there is an absolute lack of financial viability (such as in uncovered areas with no immediate prospect of deployment) or because there is a relative unviability of having more infrastructure-based operators competing for the, inter alia, sparse or financially poor or lacking digital skills/equipment population. Indeed, access to ECNs is by nature a local issue. The regulatory conduct in such situations may be different, ranging from state aid to imposing ex-ante obligations on the typically one operator that has already deployed infrastructure in the given area, depending on a thorough cost-benefit analysis. Thus, ex-ante regulation, targeted and proportionate as provided for by the EECC, is still needed at least in some parts of the countries, depending on the national specificities to remedy the market failures that cannot be addressed by competition law alone.

Furthermore, the progress so far can be undone, with prices going higher and not necessarily being reflected in connectivity-related investments. Put differently, the achievements of the last 20 years in terms of competition and end-user welfare can be reversed if the incentives in the telecoms markets are changing detrimentally to the services' provision. For instance, in any location where there is no economic space for two networks, especially in cases where the GIA does not impose any access obligation (as there are some exceptions), retail operators will fully depend on the owner of the only local access network. This owner will then be able to increase its prices in case regulation is lifted.
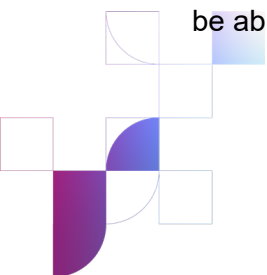
More generally, it must be underlined that currently a functioning market typically is still the outcome of regulatory measures, ex ante asymmetric regulation being strictly targeted to address market failures.

Having said this, BEREC cautions against the potential increase of the burden of proof on NRAs when conducting the three criteria test and the respective assessment of the national market situations. BEREC holds that the well-established rules and practice as regards ex-ante regulation should be maintained, including with regard to the assessment of EC's opinions on the notifications.

On the merits of regulation, although it has proven to be effective in promoting a progressive roll-out of competing network infrastructures where it was deemed feasible and, as a natural consequence, has led to the partial deregulation of more and more markets under the conditions provided by the current framework, for certain markets it seems still premature to consider their complete removal from the Recommendation on relevant markets. Realistically, a significant number of Member States may still need ex-ante regulation, at least in the short and medium run. When looking at the current situation in terms of regulation in the EU, one can notice that there are 24 Member States that regulate market 1 of wholesale local access provided at a fixed location, and 16 regulating market 2 of wholesale dedicated capacity. As regards the wholesale voice call termination markets that have been removed from the most recent Recommendation, still 20 Member States regulate at least one of them (fixed/mobile) on a national basis. The only two Member States that currently do not have any ex-ante measures imposed on any of the aforementioned markets are BG and RO.

Concerning particularly the business services underlying the wholesale market for dedicated capacity, previous BEREC analysis[51] shows that the competitive dynamics of the European business services markets are in some cases limited, with incumbents still featuring high market shares and access seekers having issues with regards to network access. This

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[51] BoR (23) 89, BEREC Report on the regulatory treatment of business services, 2023, 8.6.2023, see: https://www.berec.europa.eu/en/document-categories/berec/reports/bor-23-89-berec-report-on-the-regulatory-treatment-of-business-services_0pdf, as well as BoR (22) 184, Study on Communications Services for Business in Europe: Status Quo and Future Trends,12.12.2022, see: https://www.berec.europa.eu/en/document-categories/berec/others/external-study-on-communication-services-for-businesses-in-europe-status-quo-and-future-trends

sometimes amounts to difficulties in the development of effective competition and, therefore, the need for enhancing the market results through regulation.

Considering the number of market players and the regulatory incentives for infrastructure-based competition, including through the establishment of ex-ante regulation, the White Paper[52] seems to imply that if consumers benefit from services that are based on two fixed networks, it is sufficient to lift regulation. Such a message raises serious competition concerns, as it can be associated with duopolies, including through the potentially coordinated actions in the market. In BEREC's view, the NRAs should have the flexibility to analyse the competition situation of different market structures without any predefined criteria on the sufficient number of networks.

It is also worth noting the potential inconsistency with the EC's competition policy approach in that regard: on the one hand, the EC is concerned about reduced competition - (i) it imposed remedies on mergers like the recent case in ES in relation to Orange/MasMovil and (ii) generally, there is the observation that a 3 to 2 merger would be difficult to pass. In the same vein, BEREC previously assessed the functioning of oligopolistic market structures and, in a report, sent the message that tight oligopolies may be problematic competition-wise[53]. In its report, BEREC reviewed the economic theory, showing that oligopolistic structures can produce non-competitive market outcomes, which may be the result of tacitly colluding oligopolies (joint dominance) or of tight oligopolies where coordination does not occur, but the market structure is not conducive to efficient competition.

To conclude, BEREC is of the view that, as long as competition problems are still observed in a considerable number of countries, even if only at subnational level, it is necessary to keep a sufficiently flexible regulatory toolbox for the NRAs in order to address the observed market failures, including at the local level. Furthermore, the Recommendation on relevant markets susceptible to ex-ante regulation should remain to be used as an effective regulatory tool by the NRAs and the burden of proof of the national circumstanced should not be elevated[54]. Also, the sole reliance on ex post control seems premature in BEREC's view, considering the

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[52] Page 32-33, "[…] as we observe infrastructure competition developing notably in many densely populated areas where end customers benefit from a variety of competing services **based on at least two independent fixed broadband networks** (e.g. coaxial cable and fibre)" – emphasis added.
[54] What the EC refers to as reverse burden of proof.
[54] What the EC refers to as reverse burden of proof.

timeliness needed for intervention and the irreparable harm that may be caused in given circumstances.

With regards to the proposed change in the access policy through the introduction of a pan-European wholesale access remedy, BEREC would like to underline that this would need more details, in terms of goals, implementation and processes it requires, in order to be appropriately evaluated. BEREC believes that the actual demand by operators for such a wholesale product should be thoroughly assessed, together with any administrative obstacles they may be experiencing in accessing different EU markets. BEREC also stresses that initiatives as such could serve as a complement to national regulation. In this context, central virtual access to VHCN could indeed be useful to alternative operators (including new entrants) in the medium term, as well as a physical unbundling access product. Also, the eventual technical features of a single European access product should be explored, in order to avoid such a product being set towards the lowest denominator, leaving less or no room for differentiation or development of innovative services.

Furthermore, the legal basis for the imposition of such an access product is currently unclear if SMP regulation is withdrawn, as has already happened in some Member States, and is expressed in the EC's tentative plans. This would mean that European electronic communications markets are supposed to be not susceptible to ex-ante SMP regulation, while European remedies are being introduced. The EC furthermore mentions that wholesale broadband access networks "will remain predominantly of local character". This is in stark contradiction with the introduction of an EU-wide access remedy (even if technically possible, on which BEREC raises some doubts below, and assuming that there was a sound legal basis). Before declaring that such a remedy is needed (if technically feasible), a thorough analysis should be done to a) define the problem to be solved with such a remedy and b) to check it against the regulatory principles such as proportionality, appropriateness etc.

In light of the above, BEREC reiterates the national (sometimes even local or regional) intrinsic features of the electronic communications networks, especially for local access. Such networks have been built foremost in a national context, while practice from several countries has shown that competitive pressure in the forward-looking perspective of a full fibre environment is exerted by fibre operators that invest heavily locally or regionally (and these are not necessarily the incumbent operators).

BEREC remains available to investigate the above-mentioned legal and technological questions relating to the European wholesale access product envisaged in the White Paper, based on any additional details that the Commission may provide in the next steps of the process.

In any event, phasing out ex-ante regulation "to foster investment" is not a workable or credible option for BEREC as (i) this has not been proven to be the barrier and (ii) it contradicts **predictability** which is most relevant for investors when taking long term investment decisions. This is even more problematic since investments in telecoms infrastructure are costly, and therefore need long term predictability to ensure strong business cases. As a result, the rules set out for the market, which made the investments possible, need to be kept at least for a duration coherent with the typical period for amortizing these investments, which are of several decades for the recent fibre infrastructure. In that respect, BEREC stresses that wholesale operators are not the only players who made long-term investments: any retail operator co-investing in a network or using an access obligation to deliver services based on their own OLTs, did so based on a given economic environment which included the currently applicable regulatory framework. A too early removal of the regulation, as explained above, may endanger the business cases of these players and could eventually create a lack of confidence for other potential investments in the European market.

Looking at the proposal, it is also not clear if the envisaged standard product would be regional or local in nature - on the one hand, a regional level product may be easier to define since it would be less dependent on local national circumstances, while, on the other hand, the underlying regulatory logic regarding regulation of markets susceptible to ex-ante regulation points first to the assessment of feasibility of defining a local product, based on which the competition on the downstream central market would need to be assessed. Therefore, the "transposition" of the well-established rules of the competitive market assessments from a national to an EU-wide perspective faces some challenges. In BEREC's view, such kind of aspects would need to be deeply reflected on by the EC.

In terms of the actual characteristics of the access offers, while we can see in several countries in Europe certain similarities at a very high level (e.g.: generically, to ethernet local or central point), which are somewhat of a normal consequence of the convergence and harmonization that the European regulation has gone through, BEREC holds that it is the details that make the difference. Clearly, the high-level potentially comparable offers throughout the EU are not

compatible in details (e.g.: how an end client is identified, how ethernet frame is transmitted). These are just some examples, but further differences can be seen in a previous BEREC Report on common characteristics of Layer 2 wholesale access products in the EU[55].

Related to the financial aspects and the goal of boosting investment in Europe to fulfil the 2030 Digital Decade Connectivity Targets by earning revenues for the telecom operators, BEREC notes that switching from the current national/local ex-ante regulation to a pan-European wholesale access remedy might significantly increase the costs for both SMP operators and access seekers, as well as adding a supplementary administrative burden, and complexity in terms of governance and monitoring. In many countries, extensive use is made of wholesale access offers which are based on regulated offers. Therefore, currently, there is an equilibrium in terms of wholesale access offered/bought which took time to establish, effort (including in the form of development of appropriate cost models etc.), consultations between the NRAs and operators. Given the above, BEREC urges the EC to thoroughly assess the implications of such a proposal.

On the NRAs' side, depending on the governance and monitoring mechanisms envisaged by the EC, the additional administrative burden foreseen seems material. Moreover, the role for the NRA in implementing the proposed measure is unclear as an EU access remedy should follow an EU drafting and a coordinated EU enforcement. Essentially, the reading is that the national regulation would need to be replaced by regulation at the EU level which raises serious sovereignty, jurisdictional and enforcement-related concerns. In that line BEREC refers back to its comments on such a product in relation to the Draft TSM proposal of 2015.

Also, the link to the technological developments such as network virtualisation is missing, as well as the link to the changes described on p. 8 about operators "working together at the infrastructure layer" and "Network as a Service (NaaS)".

The proposal furthermore contradicts several provisions of the new Gigabit Connectivity Recommendation, issued in 2024, which still heavily relies on asymmetric market regulation (such as geographic segmentation of remedies and consistent price control obligations).

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[55] BoR (15) 133, BEREC Report on Common Characteristics of Layer 2 Wholesale Access Products in the European Union, 1.10.2015, see: https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-common-characteristics-of-layer-2-wholesale-access-products-in-the-european-union

Overall, the proposal seems to address (inadequately) a (future) problem when ex-ante regulation is withdrawn prematurely. In our view, the EC should thoroughly assess the implications of such a proposal and its necessity and practicability, as well as in which way it fits with other regulatory frameworks. Ahead of creating a solution without a problem, BEREC is of the view that instead of suggesting replacing "a broadly successful" (quote, p. 32) ex-ante regulation, the ex-ante regulation should be retained, where necessary.

Lastly, BEREC would like to better understand the suggested role for NRAs in relation to managing investment incentives with regards to "unreasonable overbuild", an undefined concept. The business decision to deploy a fiber network is entirely up to the network operator. If this deems the project to be profitable, even as an overbuild project, and wishes to invest, this will only enhance the infrastructure-based competition, which is still one of the objectives of the EECC. The odds for such a project are high as in most densely populated areas the cost of network deployment may be much lower than in suburban, rural or remote areas. Hence, it is very plausible that in cities two VHCNs (and possibly more) can be built and exploited profitably. The White Paper fails to explain how and why overbuild should be considered unreasonable, unless the EC has in mind that an operator with significant market power might use its market position (and its decisions to overbuild or announce to overbuild) to specifically squeeze out smaller competitors and prevent them from investing themselves.

3.8. Universal service and affordability

The objective of universal service is to provide a minimum set of electronic communications services at a specified quality to all users in the territory of a Member State, in light of the national conditions, at an affordable price, while minimizing competition distortions. BEREC considers that universal service provision or specific public social policies targeted at consumers with low income or with special social needs have proved to be an important measure to avoid or bridge the digital divide and the resulting social and economic exclusion. The scope of Universal Service in the EECC covers an adequate broadband internet access service as well as voice communications services at a given quality at a fixed location. The use of digital services in everyday life is increasingly becoming a necessity, not only for certain groups of people, but for everyone's daily activities. Digital services play a crucial role in enabling and facilitating the fulfilment of civil and business obligations, healthcare needs, and all other social activities essential for the smooth functioning of a modern society.

In this sense, it is essential to prevent digital exclusion and further social divide.

BEREC therefore understands the desirability to protect end users with respect to their access to high-quality connectivity; the reference in the White Paper is indeed not only to confirmed social cases, but also to users with a low-income and the ones on the verge of poverty, as well as to end-users who, due to their place of residence, are not in commercially feasible areas for the operators and hence cannot avail of the benefits of VHCN.

On the other hand, the EECC adopts the comprehensive approach of ensuring access to broadband internet and voice communication services (not to VHCN), extending beyond vulnerable individuals to encompass all consumers[56]. Member States are furthermore empowered to ensure affordability and access for societal participation, reflecting the flexibility within regulatory frameworks. The definition of adequate broadband internet access considers national conditions, bandwidth requirements, and technological advancements, ensuring inclusivity and adaptability.

BEREC underlines that measures to reduce the digital divide should not be mixed or confused with instruments intended to facilitate investments in VHCN deployments that are meant to achieve future connectivity ambitions, in order to avoid potential distortions in the competitive conditions of the market.

Before introducing any changes and imposing new Universal Service obligations in the direction of guaranteeing everybody's access to VHCN, BEREC therefore considers that it would be necessary to carry out a careful assessment about the economic impact on all actors and benefits for end users. The current legal framework is indeed future-proof and gives sufficient flexibility to Member States to adopt measures reflecting national circumstances when defining adequate broadband internet.

In this latter respect, turning to the financing of Universal Service obligations, BEREC notes that its Report on Member States' best practices to support the defining of adequate broadband internet access service[57] does not confirm that sector financing is the predominant

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[56] Article 84(1) of the EECC.

[57] BoR (24) 40, BEREC Report on Member States' best practices to support the defining of adequate broadband internet access service, 7.3.2024, see: https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-member-states-best-practices-to-support-the-defining-of-adequate-broadband-internet-access-service-0

form of financing, as set out in the White Paper; the document also clarifies that NI-ICS are not necessarily excluded from Universal Service financing obligations.

Concerning the consideration of vouchers in the White Paper, BEREC recalls its response to the public consultation on the draft revised EC Guidelines on State aid for broadband networks[58], where it noted that vouchers "*may be an important additional instrument to enable end-users, whose financial circumstances justify aid for social reasons, to benefit from key online services*". BEREC views the tools stemming from the EECC and vouchers, as highlighted by the EC, not as contradicting tools, but rather as complementary ones.

BEREC underlines that the regulatory framework should not be changed in a way that would restrict or limit possibilities of the stakeholders, due to their size or their market share, nor their possibility to participate or benefit from such tools, in order to avoid a negative impact on competition and harm to European citizens.

In addition, BEREC notes that the White Paper deals with end-users' rights – that are the ultimate goal of sector legislation - only within the context of Universal Service and does not address end-user protection issues, which are currently covered by Title III of Part III of the EECC. BEREC emphasizes the importance of evaluating every aspect of the regulatory framework to specifically ensure the empowerment and protection of end-users.

Additionally, BEREC highlights the need to consider the impact of any measures that might be put forward around end-user protection within the rapidly evolving digital landscape. In this respect, BEREC would like to stress the necessity of achieving a balance between meeting user expectations and experiences while safeguarding their protection and trust in digital services. This includes implementing measures to uphold high standards of security, transparency, and adaptability to technological advancements.

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[58] BoR (22) 16, BEREC response to the public consultation on the draft revised European Commission Guidelines on State aid for broadband networks, 10.2.2022, see: https://www.berec.europa.eu/en/document-categories/berec/others/berec-response-to-the-public-consultation-on-the-draft-revised-european-commission-guidelines-on-state-aid-for-broadband-networks

3.9. Sustainability

The sustainability challenges described in the White Paper accurately represent the interdependencies between the environmental and digital transitions. Digital infrastructures and technologies could play a pivotal role in addressing climate change. BEREC agrees that the potential of the sector to green other sectors should be taken into account (e.g. energy, transport, construction, agriculture, smart cities and manufacturing). However, the environmental footprint of digital technologies also needs to be taken into account. BEREC welcomes the Commission's approach to consider the role of all players of the digital ecosystem. The global greenhouse gas emissions of the ICT sector, estimated at 3% in the White Paper, could increase notably due to the rising of certain new uses (e.g., generative AI, virtual worlds) or the rise of current uses, and the energy consumption of infrastructures, as highlighted by the International Energy Agency.[59] BEREC advocates for a holistic approach to consider all the relevant environmental impacts of digital technologies. Digital activities are notably dependent on abiotic resources, including rare metals and minerals used in the fabrication of devices and responsible for other forms of environmental impacts encompassing water consumption, waste, and biodiversity

In this context, it is crucial to harness the decarbonizing potential of new technologies while minimizing their adverse environmental effects by reducing ICT environmental impact. Several key steps emerge from BEREC's work to ensure the development of greener technologies to the benefit of the environment[60]:

i. Improving the measurement of digital technologies' environmental footprint and enhancing transparency among stakeholders in the chain;

ii. Developing greener infrastructures, including through regulatory initiatives where relevant;

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[59] According to IEA analysis, data centres and data transmission networks accounted for about 330 million tonnes of CO_2 equivalent in 2020, representing approximately 0.9% of energy-related greenhouse gas emissions. Electricity consumption from data centres, artificial intelligence (AI) and the cryptocurrency sector could double by 2026. https://www.iea.org/reports/electricity-2024/executive-summary

[60] BoR (22) 93, BEREC report on Sustainability "Assessing BEREC's contribution to limiting the impact of the digital sector on the environment, 9.6.2022, see: https://www.berec.europa.eu/system/files/2022-07/10282-berec-report-on-sustainability-assessing_0_3.pdf

iii.   Supporting the most sustainable practices among the different players of the digital ecosystem to promote their environmental accountability and a sector sustainable by design;

iv.   Empowering users to access and choose the most environmentally friendly digital products (including services).

The implementation of the EU Green Deal since 2020 has facilitated the creation of instruments to address some of these challenges[61]. BEREC welcomes these developments, emphasizing the importance of allocating the necessary resources for the smooth implementation of these ambitious provisions. It also believes that other complementary measures — including those proposed in the EC's White Paper — could further contribute to this agenda and enhance the digital sector's role in the environmental transition.

BEREC welcomes the ambition of the White Paper in relation to connectivity and new technologies that contribute to achieving European climate objectives. In addition to assessing the proposals, BEREC is providing additional inputs to feed the work of the EC to:

   i)   *Improving the measurement of digital technologies' environmental footprint and enhancing transparency among stakeholders in the value chain*

The challenge of environmental transparency for digital technologies is of paramount importance to better guide public policies, regulation, and economic activity, particularly investments. The EU is establishing a new framework on green claims and the fight against unfair commercial practices that would involve the provision of tools to improve transparency mechanisms in every sector, including for ICTs. Furthermore, the ongoing work of the European Green Digital Coalition and the ITU will be a cornerstone step to better assessing the "net" carbon impact of digital technologies and to avoiding the risks of greenwashing, while highlighting the role of green technologies in the environmental transition of the EU. Additionally, complementing the progress made in environmental reporting of data centres, the work of DG Connect and the Joint Research Centre will be decisive in defining robust, common and reasonable indicators to quantifying the environmental impact of electronic

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[61] For example, the new provisions on data centres of the Energy Efficiency Directive, the new environmental labelling scheme for smartphones and tablets, the proposal to establish a right to repair could be mentioned. It can also be acknowledged that significant number of horizontal community initiatives could also help reduce the environmental footprint of digital technologies and support the EU's environmental transition, for instance, through environmental claims or eco-design of products.

communications networks. BEREC appreciates the collaboration with the EC on this topic and the use of the results of its 2023 report to support a first analysis of potential indicators.[62] BEREC considers that the Code of Conduct for ECN-ECS should be established in close cooperation with NRAs and stakeholders, including market players. BEREC also wishes to emphasize the role that regulators can play in the implementation of these EU indicators. NRAs possess the necessary expertise in networks to be able to collect and analyse environmental data from operators and can therefore contribute to improving regulatory decisions; BERECs mandate for data collection should be upheld and strengthened. BEREC is also of the view that changing the scope of the EU-taxonomy in order to encompass electronic communication networks, could help to promote the transition towards green network investments, if such an approach is based on robust and credible science-based metrics and should take into account the net impact of digital solutions.

ii. Developing greener infrastructures, including through regulatory initiatives

Regarding the role of regulators, while the data collecting provisions in the EECC do not prevent NRAs from collecting environmental data, BEREC particularly welcomes the EC's proposal to clarify the mandate of NRAs by considering environmental sustainability as a regulatory objective, and suggests including parameters for making it operational. Extending the EECC objectives by including the element of protecting the environment could facilitate the mobilisation of other regulatory tools for sustainability. Such an extension would provide NRAs with a clearer mandate to consider aspects of environmental sustainability in their decisions. Further exchange and guidance in relation to the operability of such a regulatory change would be welcomed positively, so as to prepare the way towards including environmental impacts in regulatory measures and to encourage the necessary level of coordination and harmonisation at EU level. The use of existing regulatory tools can already be a possibility for "concrete actions": BEREC is, for instance, currently working on the role of sharing in designing greener networks (and regulatory tools to promote sharing), which potentially could be a powerful tool for NRAs, especially in conjunction with spectrum awards. BEREC also believes that supporting the deployment of more efficient networks, like optical fibre, illustrates the regulators' role in transitioning to green infrastructures. Another topic
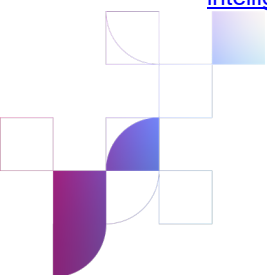
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[62] BoR(23) 166, BEREC Report on Sustainability Indicators for Electronic Communications Networks and Services, 5.10.2023, see: https://www.berec.europa.eu/system/files/2023-10/BoR%20%2823%29%20166%20Final%20Report%20on%20sustainability%20indicators%20for%20ECN%20ECS.pdf

addressed by the White Paper is the possibility of incorporating sustainability into spectrum resource management, which, in line with the work of the RSPG, appears to be an important component for more sustainable networks. Relatedly, the development of internet via satellites also poses new environmental questions, which may require action at the European level.

iii. *Supporting the most sustainable practices among the different players of the digital ecosystem to promote their environmental accountability and a sector sustainable by design*

BEREC supports the EC's ambition to work towards the environmental accountability of all stakeholders involved in the digital ecosystem. Devices account for the majority of the digital environmental footprint: players in the equipment production value chain are crucial links in the sector's transition. Existing regulations on waste, repair, and eco-design are important steps to better control the impact of these devices. On the digital infrastructure side, minimizing the environmental footprint of data centres is fundamental to supporting new uses, but also to mitigating the increase in energy consumption of networks that cloudification can represent, in connection with the findings of the EC. Of course, networks also have their part to play: as mentioned in the White Paper, the European Code of Conduct for network operators currently being prepared could be an opportunity to establish concrete objectives for sustainable ECN/ECS. CAPs can also play a role, to promote more efficient traffic management, as pointed in the White Paper, but also to improve the fight against software obsolescence, or limit the overuse of attention-grabbing strategies. In this sense, the promotion of the use of efficient codecs is a proposal from the EC that is supported by BEREC. Other measures for the eco-design of digital services could be considered by the EC, such as the obligation to make services compatible with older terminals, limiting "nudge" designs like infinite scrolling or auto- play, or adapting video resolution to the device's size[63]. The potential impact of emerging digital services like AI and virtual worlds also must be considered, so as to promote

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[63] BoR (24) 82, BEREC Report on ICT sustainability for end-users: Empowering end-users through environmental transparency on digital products, 6.6.2024, see: https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-ict-sustainability-for-end-users-empowering-end-users-through-environmental-transparency-on-digital-products[64] BEREC High-level position on Artificial Intelligence and virtual worlds, 18.3.2024, see: https://www.berec.europa.eu/en/news-publications/news-and-newsletters/artificial-intelligence-and-virtual-worlds-berec-adopts-a-high-level-position

technologies sustainably by design and contributing to the integration of increased energy consumption into energy plans in the EU.[64]

> iv.   *Empowering users to access and choose the most environmentally friendly digital products (including services).*

Finally, the last lever identified by BEREC is empowering users to play their role in the environmental transition[65]. While this issue is not explicitly mentioned by the White Paper, significant progress has been made through the application of the EU Green Deal. Additional measures could be considered to working towards a sustainability by design and circular approach in user management of the devices (by encouraging more recycling, refurbishing, repairing, repurchasing), as well as raising user awareness about the environmental footprint of their digital goods and services, through a data-driven approach, namely during the refit process of legislation on end-user rights and digital services.

To summarize, BEREC supports the ambition of the White Paper on environmental sustainability. It particularly supports the emphasis on environmental transparency, the identified need to strengthen the role of NRAs in relation to sustainability, and the ambition for the environmental accountability of all players of the internet ecosystem. It identifies, in addition to the advances of the Green Deal, remaining challenges in minimizing the digital environmental footprint and wishes to continue to make its expertise available to support the efforts to be undertaken. BEREC remains available for continuing the current activities with the Commission on measurements and other types of propositions.

3.10. Security and resilience

Despite security and resilience not falling within the exclusive legislative competence of the EU in relation to the rest of the world, it remains a highly pertinent issue in the context of the

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[64]   BEREC High-level position on Artificial Intelligence and virtual worlds, 18.3.2024, see: https://www.berec.europa.eu/en/news-publications/news-and-newsletters/artificial-intelligence-and-virtual-worlds-berec-adopts-a-high-level-position

[65] BoR (24) 82, BEREC Report on ICT sustainability for end-users: Empowering end-users through environmental transparency on digital products, 6.6.2024, see: https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-ict-sustainability-for-end-users-empowering-end-users-through-environmental-transparency-on-digital-products

single market. For this reason, cooperation and coordination are crucial in this sector, as mentioned in chapter 3.2.

The Nevers Call of March 2022 recognised the utmost importance of resilient communication infrastructures. As a follow-up, a concrete action plan was set up involving all relevant stakeholders, including BEREC. The effective coordination among all competent authorities and stakeholders is of paramount importance, particularly in terms of efficiency and the swift implementation of necessary measures. BEREC considers it to be necessary for all stakeholders involved to work on the consistent application of the framework provisions.

BEREC acknowledges the effect of a strong EU position in the Research & Innovation sector as well as in the development of security standards covering the entire value stack, from end-to-end and from the hardware layer up to the service layer, on the security and resilience of EU communication networks. It is important that such a process takes into outmost account the work ongoing in fora like 3GPP, IETF and GSMA. Furthermore, any standards development could also benefit from setting functional requirements and not in terms of absolute requirements. Technical/specific requirements tend to become obsolete over time and as technology develops.

It would be crucial to evaluate the possible impact of the implementation of high security standards on the connectivity and capacity goals, being mindful that such considerations would have to be proportionate.

BEREC agrees that a precondition for secure communications is a higher level of resilience and integration of all communication channels: terrestrial, non-terrestrial and submarine. Accordingly, BEREC welcomes the approach set out in Pillar III of the White Paper and supports new approaches to strengthening the security and resilience of submarine infrastructures but emphasizes the need to maintain protective measures within appropriate and pragmatic boundaries at the same time.

Finally, Quantum technologies will gain increased importance. BEREC recognises the need to timely address the anticipated cybersecurity threats coming from potential malicious use of future large-scale quantum computers. On the other hand, BEREC also underlines the need to identify the impact that the powerful quantum computing capabilities confer on many research activities and applications, such as medicine, space communications, metaverse, AI, machine learning, big data, etc.