



OPINION

European Economic and Social Committee

The societal and ecological impact of the 5G ecosystem

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[own-initiative opinion]

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1. **Conclusions and recommendations**

- 1.1 The EESC observes that the rapid digitisation and development of electronic communications has a strong impact on the economy and society at large. Through the responsible use of these technologies, humanity has a historic chance to build a better society. Nevertheless, without due diligence and democratic control, our communities might face serious challenges in the administration of these technological systems in the future.
- 1.2 The EESC acknowledges that electronic communications infrastructure can greatly improve the quality of life of citizens and has a direct influence on fighting poverty. 5G technology presents an enormous opportunity to improve human health services through the development of telemedicine and by improving access to medical care. The important role that telemedicine has played during the pandemic is recognised in society.
- 1.3 The EESC notes that the debate on the deployment of 5G networks has turned into a controversial and political discussion, but nevertheless, social, health and environmental issues need to be clarified, involving citizens and all relevant actors.
- 1.4 The EESC encourages the European Commission to move forward in the process of assessing the multisectoral impact of new 5G and 6G technologies, considering that tools and measures are needed to address risks and vulnerabilities. Therefore, the EESC recommends that European and national funds be allocated towards more in-depth multidisciplinary research and impact studies focused on both humans and the environment, and also towards disseminating these results in order to educate the public and decision-makers.
- 1.5 The EESC proposes that the European Commission, consults citizens and civil society organisations and through the involvement of all relevant public institutions can feed the decision-making process with respect to the societal and ecological impact of mobile electronic communications.
- 1.6 The EESC considers that the EU needs an independent European body, with up-to-date methodologies, in line with the current technological context and a multidisciplinary approach, to establish guidelines for the protection of the general public and workers in the event of exposure to radio frequency electromagnetic radiation.
- 1.7 The EESC recommends that all radio frequency transmission stations and the frequency bands on which they operate be inventoried and this information published for better territorial management and the protection of the interests of citizens, particularly of vulnerable groups (children, pregnant women, chronically ill persons, the elderly, electrohypersensitive people). The health and safety of workers must also be taken into account.
- 1.8 The EESC supports the idea that 5G network equipment must be designed, from the factory, with capabilities to provide real-time and public information on the emission power and other relevant technical parameters for the consumers' organizations and the interested public. These data must be centralised, managed and disclosed by the competent authorities.

- 1.9 The EESC believes that monitoring and control of electromagnetic pollution must be carried out on the basis of a rigorous interinstitutional and interdisciplinary scientific approach, supported by the provision of modern equipment for measuring the parameters of electronic communications networks, so that the cumulative effects over longer periods of time are properly highlighted and evaluated.
- 1.10 While there is no recognised scientific data showing a negative impact of 5G on human health, the EESC believes that the social, health and environmental aspects of 5G need to be continuously monitored in line with the precautionary principle. It recognises the concern about health effects, including thermal and non-thermal, exposure intensity and long-term effects of such exposure. Some regions/areas will concentrate more exposure than others, and in such cases, specific measures should be considered, including the recommendation to extend the application of the ALARA Principle to limit the effects of electromagnetic radiation generated by 5G networks.
- 1.11 The EESC notes that exposure of the population to a variety of electromagnetic fields is almost impossible to avoid. When reviewing the exposure limit values in the European Directive on minimum health and safety requirements for the exposure of workers to the risks posed by physical agents (electromagnetic fields)¹, the social partners should be involved from the outset. Special attention should be paid to non-thermal effects.
- 1.12 Health and safety protection measures must be enhanced and consolidated through rigorous monitoring of the radiation levels and by a strict application of safety standards for people working near sources of electromagnetic radiation.
- 1.13 The EESC notes the need to update the institutional mechanisms aimed at upholding all human rights in the new context of hyperdigitalisation, hyper-automation and hyperconnectivity facilitated by the implementation of 5G, considering that any technological development must incorporate these universal values which represent a valid and necessary dimension in the assessment of the cost-benefit report.
- 1.14 The EESC understands citizens' concern about ensuring that their property rights are upheld in the distribution of antennas or the right to own their own bodies in the context of 5G networks extending everywhere, from their own homes to orbital satellite. The right to property and people's choices must be respected. The definition of informed consent should be guaranteed, so that the citizen has a real right to free, fully informed and valid consent.
- 1.15 The EESC supports the strengthening of European capacities for cyber risk prevention, education and protection, both by strengthening relevant institutions such as ENISA and by creating technological, institutional and legal instruments to ensure that citizens' rights are respected. In order to remedy certain security threats, the EU should invest more in building its own technologies and supporting the tech industry and developers. Most importantly, these

¹ Directive 2013/35/EU of the European Parliament and of the Council of 26 June 2013.

actions should be tailored to incentivise European SMEs to develop secure and reliable 5G infrastructure.

2. Introduction

- 2.1 5G is not a new technology per se; it is a development of existing technologies (from 1G to 4G) and will exist alongside them. This will result in a mixed network of networks: a greater number of more varied radio frequency bands, a range of devices that exchange data and a plethora of interactions with users. Some of the new equipment and the new technologies employed might have different effects than the previous generations.
- 2.2 5G technology should allow for wireless hyperconnectivity, the ability to cover and connect up a huge number of devices and much faster transfer speed measured in Gbps. It will achieve this by means of beamforming spectrum aggregation and multiple parallel connections using both Massive MIMO antennas (the operator's phased-array base station) and regular MIMO antennas (the client's own device) and low latency (milliseconds for the operator's own infrastructure but not with the rest of the internet).
- 2.3 A 2019 study by GSMA shows that the new 5G network capabilities are needed for autonomous driving, virtual reality, augmented reality and the "tactile internet"; the other applications can be delivered using current technology (4G LTE and fibre optic). 5G technology will also speed up the transition to Industry 4.0 and facilitate the development of applications based on artificial intelligence, and therefore, this technology is considered to be a key and necessary element in the development of a modern, increasingly automated and digitised economy.
- 2.4 There are scientific communities around the world who have put forward evidence² that there is valid cause for concern regarding prolonged, ubiquitous exposure of the human body and other biological organisms to the range of microwave frequencies used by 5G networks and the 10-20-30 or more gigahertz radio sections and frequencies specific to 5G technologies, as well as the potentially harmful effects on human health, biodiversity and the environment. However, until now, relevant EU and national public authorities have communicated that there is no scientific proof of 5G's negative impact on human health. The WHO states that "to date, and after much research performed, no adverse health effects has been causally linked with exposure to wireless technologies".
- 2.5 Together with the emerging technologies it facilitates, 5G brings uncertainty and as with every new technology, some effects which may be yet invisible. In order to properly address any question about 5G's impact on public health and to prevent public opinion being the victim of disinformation, civil society considers that suitable anticipatory governance is needed, applying the *precautionary principle* to the European legislative process for regulating this new technological generation of electronic communications.

² <https://ehtrust.org/environmental-health-trust-et-al-v-fcc-key-documents/>

3. **General comments**

- 3.1 Broadly speaking, international institutions, corporations and national authorities are unabashedly enthusiastic about the advantages that 5G technology will bring. However, it is necessary to study if any negative effects could appear as the 5G ecosystem develops and, implicitly, the conditions required for social acceptance of these infrastructures and services which have a significant societal impact.
- 3.2 With the rapid development of electronic communications technologies and internet infrastructure, there has been increasing debate among the general public and organised civil society in developed countries regarding the need to and benefits of exponentially speeding up the development of ICT networks. Public authorities need to acknowledge challenges linked to the ways these technological systems could potentially affect the environment, living organisms or people's civil rights.
- 3.3 At European level, concerns about the potential effects of electromagnetic pollution on health are set out in recital 31 of Decision No 243/2012 of the European Parliament and of the Council of 14 March 2012 establishing a multiannual radio spectrum policy programme: "A coherent approach to spectrum authorisation in the Union should take full account of the protection of public health against electromagnetic fields which is essential for citizens' well-being. While observing Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz), it is essential to ensure constant monitoring of the ionising and non-ionising effects of spectrum use on health, including the real-life cumulative effects of spectrum use in various frequencies by an increasing number of equipment types."

4. **Specific comments**

5G technology and the impact on people's civil rights

- 4.1 In recent years, several civil society organisations in the EU and other countries have issued warnings about the harmful effects and complex, serious crises which might be triggered by a lack of democratic control and transparency and by security threats arising from dependence on technologies provided by third-country players.
- 4.2 The electronic communications industry and the disruptive 5G-type applications it offers are based on the exploitation of two very important resources. Firstly, the use of the radio frequency spectrum. This is a limited natural resource which is owned by the people and managed on their behalf by governments through national agencies or other public bodies that lease these resources to electronic communications operators.
- 4.3 Another essential resource is access to the data and metadata of consumers and individuals. With the development of the digital services market, these data are hugely valuable and give

enormous benefits to the companies which utilise them. Some of the challenges in this regard were highlighted in the EESC's opinion on Data Strategy³.

- 4.4 Taking the above into consideration, it has to be underlined that 5G and data sharing and aggregating, like many other technologies, is a powerful tool that can be used to strengthen civil society, make public services more effective and reliable, and reduce inequalities by boosting economic growth. Hence, the EU and the Member States should take advantage of 5G technology to improve access to high-quality data and develop better digital administration infrastructure (e-administration), thereby bringing public and democratic institutions closer to the citizen.
- 4.5 Consequently, the responsible and sustainable development of electronic communications infrastructure should improve the quality of life for ordinary citizens, especially in the regions and less developed countries. The development of these technologies thus has a direct influence on fighting poverty.
- 4.6 In order to roll out 5G networks with all speed, the European Union, through Directive 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Articles 42, 43 and 44), created a regulatory framework facilitating electronic communications operators' access to property on which equipment and infrastructure facilities vital for the development of these networks need to be installed. Civil society monitors the interpretation of this provision, so that the transposition of the directive does not lead to unconstitutional derogations from the guarantee of citizens' property rights.

Impact of the 5G ecosystem on the environment

- 4.7 Some civil society organisations have flagged up the potential environmental impact of the new 5G networks. Some of their allegations relate to insufficient provision made for environmental impact studies or inappropriate mechanisms and measures to reduce the energy footprint of 5G network infrastructure or promote recycling of electronic waste⁴.
- 4.8 In order to carry out a proper evaluation of the impact of 5G on the environment and climate, public authorities must take into account aspects like GHG emissions⁵, critical raw material availability and consumption, the amount (and sources) of energy used by all objects connected and used within IoT, as well as the amount (and sources) of energy used to transport wireless data and run data centralisation and transit points.

³ TEN/708 - OJ C 429, 11.12.2020, p. 290

⁴ <https://www.greenpeace.org/static/planet4-eastasia-stateless/2021/05/a5886d59-china-5g-and-data-center-carbon-emissions-outlook-2035-english.pdf>

⁵ https://www.hautconseilclimat.fr/wp-content/uploads/2020/12/rapport-5g_haut-conseil-pour-le-climat.pdf

- 4.9 With the roll-out of 5G and the Internet of Things, billions of new 5G network elements and household goods (electronic and white goods, facilities, etc.) will be added to the category of electronic waste (*e-waste*)⁶, which has to be taken into account in the context of the concept of the circular economy as well as zero waste policies.

Concerns regarding the impact of 5G networks on human health and living organisms

- 4.10 5G technology presents an enormous opportunity to improve human health. The development of ICT infrastructure and incorporation of 5G will speed up the advance of telemedicine, including through the concept of the internet of things. 5G will enable complex surgery to be carried out remotely, thus greatly improving access to high-quality medical care, especially to those who cannot afford to travel abroad in order to receive the treatment they need.
- 4.11 The development of telemedicine is especially important in times of pandemic, where stationary access to medical care is greatly decreased. Moreover, 4G technology has allowed for the development of teleradiology. ICT infrastructure has enabled patients to be diagnosed remotely (MRI, CT) and receive a quality medical service, regardless of the location. The technology of 5G will further develop that process, allowing people to have better access to diagnostics and direct medical services that are performed remotely.
- 4.12 On the other hand, the rapid technological development of the last 20 years has led to an increase in electromagnetic fields and implicitly to increased pollution due to this electrosmog. The impact of electrosmog needs to be addressed with an evidence-based approach in order to evaluate the real risk.
- 4.13 Electromagnetic hypersensitivity or electromagnetic intolerance is an illness which has been recognised by the European Parliament⁷, the EESC⁸ and the Council of Europe⁹. It affects a number of people, and with the roll-out of 5G (which needs a much denser electronic network) it is to be expected that this condition may affect more.
- 4.14 Globally, studies have been conducted which conclude that the biological effects of electromagnetic radiation do not present any health risks, provided national or ICNIRP standards are met. At the same time, there are also studies conducted since the 1970s up to the present¹⁰ which have concluded that there are dangers for human health¹¹.

6 <https://www.itu.int/en/ITU-D/Climate-Change/Pages/Global-E-waste-Monitor-2017.aspx>

7 European Parliament resolution of 2 April 2009 on health concerns associated with electromagnetic fields (2008/2211(INI)) 28. https://www.europarl.europa.eu/doceo/document/TA-6-2009-0216_EN.html?redirect

8 EESC's Opinion on Secure 5G deployment – EU toolbox: TEN/704 - [OJ C 429, 11.12.2020, p. 281](https://eur-lex.europa.eu/eli/oj/2020/0004/01/01/html)

9 Resolution 1815 (2011) final version, Art. 8.1.4 <http://assembly.coe.int/nw/xml/XRef/Xref-XML2HTML-en.asp?fileid=17994>
10 <https://bioinitiative.org/updated-research-summaries/>

11 Defence Intelligence Agency – Biological Effects of Electromagnetic Radiation (Radiowaves and Microwaves) – March 1976.

- 4.15 In reports on concerns relating to the long-term exposure of people to electromagnetic fields generated by 5G technology produced in 2019 and 2020 respectively, the European Commission and the Federal Communications Commission (FCC)¹² argue that there is no solid or credible scientific proof of health issues caused by exposure to radio frequency energy emitted by mobile telephones.
- 4.16 Years ago, the World Health Organization classified the electromagnetic field produced by radio frequencies as a possible carcinogen; it now takes a similar position to that of EU and US authorities. However, with the roll-out of 5G networks, it announced in 2022 that it would conduct another evaluation of the risks of electromagnetic fields for the radio frequency spectrum (from 3 kHz to 3000 GHz)¹³.
- 4.17 The final version of Resolution 1815 of 27 May 2011 of the Council of Europe on *The potential dangers of electromagnetic fields and their effect on the environment* warns about the impact of electromagnetic pollution on human health and includes a set of general and specific recommendations for a consistent medium- and long-term approach to the challenges posed by the proliferation of mobile telephony. This document underscores the need to take all reasonable measures to reduce exposure to electromagnetic fields in line with the ALARA principle¹⁴, which must be applied in the event of ionising radiation.
- 4.18 There are studies arguing that the effects of radiation emitted by mobile telephones and wireless communications infrastructure (even non-thermal emissions) pose risks to human health from a neuronal, reproductive, oncologic and genotoxic perspective¹⁵. However, the relevant institutions consider, based on their own assessments and methodologies, that the radiation emitted by mobile telephones and wireless communications infrastructure is safe for humans.
- 4.19 As mentioned above, there are studies that have examined the impact of electromagnetic radiation on human and animal health. However, very little is clarified and even less is communicated regarding the complex impact that exposure to non-ionising electromagnetic radiation might have as a non-thermal effect on flora and fauna. The best known studies refer to the significant and immediate impact on pollinators and birds, but scientists are very concerned about the long-term impact of electromagnetic emissions on living ecosystems.

12 The FCC's position has been challenged in court by US civil society organisations: <https://ehtrust.org/eh-takes-the-fcc-to-court/>

13 According to the International Telecommunication Union (ITU) Radio Regulations.

14 *As Low As Reasonably Achievable* - the ALARA principle is used when establishing programmes to safeguard against ionising radiation.

15 For example, the European REFLEX study (2004) that was carried out on behalf of the EU by 12 academic institutions with a total budget of over EUR 3 million, with a EUR 2.059 million contribution from the European Commission.

Allegations regarding ICNIRP guidelines¹⁶

- 4.20 The European Commission and the vast majority of national governments around the world use ICNIRP guidelines when setting limits for public exposure to electromagnetic field radiation. The ICNIRP guidelines updated and published in 2020 also took account of beamforming and frequencies - parameters that are specific to 5G, but the frequencies aggregation and the increased density of connexions were not taken into account.
- 4.21 Despite the fact that ICNIRP goes to considerable lengths to communicate the scientific methods used to establish the protection guidelines, it only recognises the thermal effects produced by electromagnetic radiation as being potentially harmful.
- 4.22 The STOA study carried out by the European Parliament¹⁷, in line with the recommendations set out in the Council of Europe's Resolution No 1815 of 2011, argues in favour of abiding by the precautionary principle, reviewing the thresholds proposed by ICNIRP and adopting technical and administrative measures to reduce the impact of electromagnetic pollution produced by electronic communications.
- 4.23 The measures proposed seek to ensure a more responsible architecture for communications infrastructure (placement of antennas and other specific equipment), to ensure that the general public is informed about the potential effects of electromagnetic pollution and the options available to them to reduce the impact of exposure to electromagnetic radiation, to develop capacity to monitor electromagnetic fields, etc. European and national funds should be provided in order to carry out more in-depth multidisciplinary research and impact studies on humans and the environment, and also to disseminate the results to educate the public and decision-makers.

5G cybersecurity – Tools, measures and their effectiveness

- 4.24 The EESC has already highlighted many of the cyber security challenges in its Secure 5G deployment - EU toolbox opinion¹⁸. Unresolved cyber vulnerabilities in 4G will be amplified in 5G. These reside at the technical level of architecture, topology and protocol, as mapped by ENISA¹⁹, and, according to the NIS Report²⁰, cannot yet be countered with efficient measures.

¹⁶ International Commission on Non-Ionizing Radiation Protection

¹⁷ <https://www.home-biology.com/images/emfsafetylimits/EuropeanParliamentSTOA.pdf>

¹⁸ [OJ C 429, 11.12.2020, p. 281.](#)

¹⁹ https://www.enisa.europa.eu/publications/enisa-threat-landscape-report-for-5g-networks/at_download/fullReport

²⁰ https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=64468

4.25 In order to remedy certain security threats, the EU should invest more in building its own technologies and supporting the tech industry and developers. Most importantly, these actions should be tailored to incentivise European SMEs to develop secure and reliable 5G infrastructure.

Brussels, 20 October 2021

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