

## University of Oulu view on Draft RSPG Opinion on the role of radio spectrum policy to help combat climate change



University of Oulu, Finland, thanks the RSPG for the opportunity to comment on the draft RSPG Opinion on the role of radio spectrum policy to help combat climate change. The research community at large, including the wireless communications research, has recently taken the United Nations Sustainable Development Goals (UN SDGs) as a key driver, whereof climate action is one the 17 goals. The University of Oulu welcomes the action proposed by the RSPG and provides the following detailed comments on the draft Opinion topics (Section 1), followed by new ideas for consideration to the RSPG (Section 2).

### 1. Detailed comments on topics in the draft RSPG Opinion

*Item 1) RSPG invites the European Commission with Member States to promote the development of methodologies to assess the impact of ECS wireless technologies on climate change (i.e. Energy Efficiency, Circular Economy, etc.) with the involvement of ECS stakeholders and all interested parties (including citizens) and, where appropriate, with the support of the European Telecommunications standardisation Institute (ETSI) including if needed CEN, CENELEC. Those methodologies should include a focus on ECS radio component (base stations and user terminals) including the impact of frequency bands.*

The University of Oulu welcomes the development of methodologies to assess the impact of wireless technologies on the climate change and calls for an open approach where the research community can contribute its findings to the process. The process should not be left only in the hands of the telecommunication industry including operators, which corresponds to self-evaluation. The RSPG should invite the research community to provide unbiased research results and encourage the industry and operators to share their data and methodologies with the research community, to tackle the climate change as a joint effort. The telecommunication sector itself needs to go through a major renewal of its own operations to contribute to meeting sustainability targets, in addition to its role as an enabler to renew the operations of other sectors of society.

*Item 2) RSPG invites the European Commission to always take energy efficiency and other climate related aspects into account when funding research within the wireless sector, such as 6G.*

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The University of Oulu would like to highlight that the climate action is one of the 17 goals in the global UN SDG framework. Sustainability and sustainable development especially in the form of the UN SDG framework have become criteria in many research funding agencies' decision-making, stressing the need to thoroughly consider sustainability related topics in the research community, including but not limited to climate change.

*Item 3) RSPG invites the MS to initiate national climate and environmental strategies within the ICT sector and urges the European Commission to put forward an EU wide strategy based on the national strategies.*



The development of national-level climate and environmental strategies for the ICT sector is of utmost importance and the approach taken in Finland<sup>1</sup> is a timely benchmark both in terms of the outcome and the process. The involvement of the research community should be promoted in such activities.

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*Item 8) RSPG points to the fact that a.) At this stage, current harmonised spectrum could respond to various technology needs, stakeholders' strategies and development trends; and b.) spectrum needs and demands to help combat against climate change can change over time due to a number of factors, in particular the implementation of energy regulations resulting from the Green Deal. It is consequently important to regularly review the forecast long-term spectrum needs and spectrum demands aimed at combating Climate change.*

The University of Oulu would like to emphasize the role of spectrum sharing in accommodating stakeholders' changing and conflicting spectrum needs. Spectrum access models based on spectrum sharing can be particularly effective for serving local and temporal spectrum needs by various stakeholders who currently do not have dedicated spectrum access rights. RSPG should promote spectrum sharing for timely access to spectrum for new innovations and to reach long-term compromises between conflicting needs, as a follow up for the initial ideas presented in the RSPG Opinion on Spectrum Sharing published in June 2021. A concrete example of this is local spectrum licensing.

*Item 9) RSPG confirms that all the sectors, which can benefit by using wireless technologies in their efforts to reduce emissions, already have a process available (either at international or European or national level) in order to address either future specific spectrum needs or spectrum demands triggered by the evolution of technology.*

Spectrum needs identification is only one part of the process of gaining access to spectrum, which is a lengthy process. There are no mechanisms for rapid accommodation of arising spectrum access needs of new innovative technologies and services that address major societal challenges, such as the

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<sup>1</sup> Climate and Environmental Strategy for the ICT Sector. Ministry of Transport and Communications Finland. March 2021. <http://urn.fi/URN:ISBN:978-952-243-595-8>

climate change. Their adoption is restricted the license-exempt bands, subject to strict operational conditions, which significantly restrict e.g., outdoor operations. The meeting of the emerging needs of new innovations to combat sustainability challenges would benefit from faster access to spectrum through spectrum sharing. The RSPG should promote sharing-based spectrum access, such as local licensing, as a mechanism to provide rapid access to spectrum to solve major sustainability challenges in Europe following its Opinion on Spectrum Sharing published in June 2021.

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*Item 14) Caution shall be applied when trying to address the perceived spectrum needs and requests from the sectors which can benefit from wireless technologies in their efforts at reducing emissions because existing processes may already have been triggered.*

There are no proper mechanisms in the current spectrum regulatory framework to allow fast access to spectrum for new innovative wireless solutions and services that aim at solving major sustainability challenges in Europe. The RSPG should promote spectrum sharing to allow new wireless innovations that address major societal challenges to access the market.

*Item 15) Member States should ensure the availability of spectrum for public transport purposes, as appropriate.*

Previous item 14) calls for caution on sector-specific spectrum requests, which seems to contradict with this statement of needing to ensure public transport spectrum availability, without explaining what the public transport sector-specific needs are that require dedicated spectrum, in comparison with what e.g., mobile communication networks can provide for the transport sector.

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*Item 18) Member States should recognize that monitoring of climate change, collecting data for weather forecasting or gathering climate-related data are important tools to provide evidence related to combatting climate change and facilitate the response to its consequences. In consequence, Member States and the European Commission should ensure long-term spectrum availability and protection for radio systems supporting them, where appropriate.*

New methods to collect data on sustainability-related topics, such as the climate action, are likely to emerge in the future. It is equally important to promote the entry of new innovative wireless systems for the data collection, potentially through innovative shared spectrum access methods, as it is to protect the existing systems currently collecting climate related data.

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*Item 24) RSPG recognises that the availability of large contiguous frequency blocks per operator could avoid the energy consumption associated with the support of multiple carriers and carrier aggregation. Member States may*

*strive to improve the energy efficiency of networks by making available spectrum in the largest blocks possible where appropriate.*

The need for large contiguous spectrum bands per operator is the only measure related to spectrum awards taken in the draft Opinion to improve energy efficiency of wireless networks. The RSPG should also promote the development of other measures and techniques to promote energy efficiency of networks that were mentioned in the RSPG Report on climate change published in June 2021.

*Item 25) The RSPG considers that Member States should award spectrum in a timely manner for the development of innovative services to mitigate climate change.*

Timely access to spectrum for the development of innovative service to mitigate climate change and to reach other sustainability targets is of utmost importance. However, it is unclear how the promotion of spectrum awards for these new innovative services is considered in the current spectrum regulatory framework. The process of gaining access to spectrum is lengthy and complex, while spectrum access needs for new innovative solutions combating sustainability challenges can arise at a rapid speed. Will there be new spectrum awards for “new innovative services to mitigate climate change”; how does that fit into the current spectrum regulatory framework; and what approaches will be applied for new innovative service to achieve other sustainable development goals than the climate action? The RSPG should promote spectrum sharing as a means for timely spectrum access to combat climate change and other sustainability-related challenges.

*Item 26) The RSPG recommends that Member States assess how active or passive infrastructure sharing may help reduce the carbon footprint of wireless ECS while maintaining competition objectives. Based on the results of these assessments, Member States should consider enabling infrastructure sharing among operators.*

Mechanisms to reduce the carbon footprint through sharing of various resources, including the infrastructure and spectrum, should be promoted. The RSPG should not restrict the focus to infrastructure sharing only but consider all potential wireless communications resources.

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*Item 28) The RSPG recommends that the European Commission, and where appropriate the Member States, determine whether ECS Network operators should be required to report on their emissions and the actions they are taking to achieve the Union’s environmental targets. The RSPG will contribute to any such determinations within its field of knowledge and expertise. If legal measures are put in place in respect of such reporting, the RPSG recommends that a harmonized approach to the reporting is adopted across the European Union. Any necessary assessments (in line with recommendation 1) above) should be made as regards the measurement methodologies to obtain reported data.*

Telecommunication industry and operators play a key role in ICT sector's attempts to combat the climate change. Self-assessment of own operations and reporting on emissions and actions to achieving environmental targets is an important starting point. Detailed data and actions on energy efficiency and energy consumption among other sustainability-related metrics should be made available to the research community to allow researchers to develop new methods to assess and reduce resource efficiently and consumption based on real data, which today is a true bottleneck.

## 2. Additional topics of consideration

Recognising that the draft RSPG Opinion focuses on combating the climate change, the University of Oulu would like to highlight that the topic of sustainability and sustainable development is much wider and needs a thorough consideration. The UN SDG framework where the climate action is one of 17 goals, has become a key driver for the research community, in the attempt to solve major societal challenges. The EU-level goal of "climate neutrality" is about "emitting less and absorbing more". The draft RSPG Opinion focuses on the role of wireless technologies in "emitting less" but very little emphasis is on the role of wireless technologies in supporting of "absorbing more" in various sectors where impact could be achieved. The RSPG should emphasize the role of wireless technologies in supporting to "absorb more" in the draft Opinion and welcome the development of innovative approaches.

The RSPG report on climate change published in June 2021 includes a number of important observations and recommendations, which however were not reflected in the current draft Opinion. These elements are summarized in the following and proposed to be reconsidered to be taken into the draft Opinion:

- *"...confirmed a need to better analyse the impacts of the operating frequency, the usage of higher frequency bands (such as mmWave), active antennas and small cells on the energy consumption of wireless equipment, and the interaction of these elements with energy consumption."*

The RSPG should include the need for a better analysis of the impacts of operating frequency and other elements on the energy consumption. Additionally, the network architecture has a significant impact on the total energy consumption. The optimization of the collection, processing, storage and transfer of data between different locations and components becomes a complex task and calls for the development of new metrics and measurement methods to assess the sustainability of such solutions including the end-to-end energy consumption through different network configurations.

- *"...noted that the currently available data on the impact of the wireless sector comes from different sources such as academia, non-profit organisations and the industry. They are based on different methodologies and data sources and it is complex to establish a comparison between them. Nevertheless, there is currently a lack of data and transparent, trustworthy information is essential to enable policymakers to move in the correct direction and to empower*



*technology users to make more sustainable choices.”*  
The RSPG should promote sharing of methods and data on the impact of the wireless communications sector between telecommunication industry, operators, and academia as well as sectors that could benefit from wireless technologies.

- *“Current barriers to the use of wireless technologies within smart agriculture include, for example lack of coverage: • Underinvestment in communications networks in rural areas in countries which follow a market-based approach to network roll-out; Rural areas gain late access (if at all) to new technologies, which results in devices not being designed for the latest technology, emphasising a negative feedback loop. • For some technologies coverage issues may exist (e.g. 5G).”*

The RSPG should promote spectrum sharing to allow underserved areas to be served by different stakeholders, by making spectrum available where and when it is not used by the existing holders of spectrum usage rights. While this is a national matter, the RSPG should promote spectrum sharing that is in its agenda through concrete actions such as promoting the serving of the underserved.

- *“...terms and conditions in spectrum authorisations in accordance with the EECC are one of many ways to alter the carbon footprint of radio communication, in particular to reduce energy consumption and to decarbonise the electricity used. It is, however, a political issue whether this should be done and under what circumstances. The regulatory decision lies within the scope and responsibility of the MS of course. Sharing best practices on reducing the carbon footprint related to wireless communication networks and equipment in the European Union will contribute to overall steps to combat against climate change.”*

Spectrum authorisations and related spectrum management approach such as administrative allocation, market-based mechanisms, and the unlicensed commons, play a key role in defining wireless markets. Spectrum authorisations ultimately define who can operate wireless systems and how, which eventually creates carbon footprint and other sustainability impact. Spectrum authorisations are a powerful tool to both incentivize and force spectrum users to act towards sustainability goals, including climate action, if desired by the national regulators. Yet, this is under-explored and the RSPG should promote new studies on the connection between spectrum management and major sustainability challenges. Spectrum authorisations are also fundamental in allowing new market entry for innovative wireless solutions combating sustainability challenges, which is not considered in the current spectrum regulatory framework. Rapid access to spectrum for innovative wireless services should be promoted via spectrum sharing. While spectrum authorisations are a national matter, the approaches developed and trialed in one country, can through sharing of best practices help the European ICT sector to develop, trial and deploy innovative wireless solutions to solve sustainability challenges globally.

Finally, University of Oulu would like to draw attention to the future wireless systems emerging a decade from now, especially 6G. The research towards 6G started in the Finnish 6G Flagship in 2018 and rapidly expanded globally.



The commonly agreed key driver in 6G research and development is sustainability<sup>2</sup>, especially in the form of the UN SDGs, where climate action is one goal. 6G Flagship published a White Paper on 6G Drivers and the UN SDGs<sup>3</sup> building a connection between future wireless systems and the UN SDGs through indicators. 6G will combine communication service with other services, such as imaging, sensing, and locationing, providing a measurement tool to collect various data at hyper-local granularity, which can be used to steer operations towards sustainability targets. The research community developing future wireless systems takes sustainability seriously. The University of Oulu invites the RSPG to expand from combating climate change to considering sustainability at large in the context of radio spectrum, in close collaboration between stakeholders representing industry, academia and regulation. Concrete examples include 1) wireless technologies for the development of future sustainable smart cities via massive automation of society; and 2) wireless solutions for remote areas closing the gap of digital divide and enabling sustainable development.

Respectfully,

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<sup>2</sup> Key Drivers and Research Challenges for 6G Ubiquitous Wireless Intelligence. 6G Flagship, University of Oulu, Finland, Sept 2019. <http://urn.fi/urn:isbn:9789526223544>

<sup>3</sup> White Paper on 6G Drivers and the UN SDGs. 6G Flagship, University of Oulu, Finland. June 2020. <http://urn.fi/urn:isbn:9789526226699>

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