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COMMISSION STAFF WORKING DOCUMENT
EVALUATION

**Interim Evaluation of the Horizon Europe Framework Programme for Research and
Innovation (2021 - 2024)**

Accompanying the document

Communication from the Commission to the European Parliament and the Council

Horizon Europe: Research and Innovation at the heart of competitiveness

{COM(2025) 189 final}

Annex 20: Evaluation of Smart Networks and Services (SNS) JU

Annex to the Commission's interim evaluation of Horizon Europe

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1. Effectiveness

This is an evaluation of the Smart Networks and Services Joint Undertaking (SNS JU) partnership (2021-2031) and its predecessor under Horizon 2020, the 5G PPP (2014-2020), both aimed at developing the next generation of mobile communication technologies as key infrastructure for the economy and society. While the 5G PPP¹ focused on 5G mobile telecommunication technology standards, the SNS JU² aims to develop technologies for 6G and boost deployment of 5G. As an external evaluation³ found, both partnerships were (and are) successful in accelerating technology development, leveraging funding, and enabling early collaboration among leading European companies for greater control over key aspects of the technology.

Horizon 2020 – 5G PPP: The aim of the 5G PPP under Horizon 2020 was to deliver solutions, architectures, technologies and standards for the next generation of communication infrastructure, most notably 5G; to secure Europe’s leadership; and to create new markets.

Overall, the 5G PPP successfully met its objective to ‘conduct research and innovation work that will form the basis of the 5G infrastructure’⁴ by efficiently and effectively managing the projects and calls⁵. It covered more than 90 projects over the entire period, which was organised in three phases, covering basic research, system development and the use of 5G technology in vertical industries, and validation and research activities targeting developments beyond 5G⁶. For instance, one project under the 5G PPP was Hexa-X⁷, a flagship project for 5G and 6G development that focused on technology enablers for connecting the human, physical, and digital worlds.

Another objective of the 5G PPP was to ‘support the emergence of global standards’⁸. This objective has been achieved as the 5G PPP fostered European participation in standardisation activities and was an active contributor to 5G standardisation globally (see Section 1.b). Another aim of the 5G PPP was to foster innovation across the 5G value chain as well as linking 5G technology development with its use cases in vertical industries, reflected in the objective to ‘validate technologies from a technical and business perspective through early trials and reference deployments’. This was realised as the 5G PPP shifted from research activities (first stage) to large trials in different vertical industries. The objective to ‘reinforce the European

¹ [Regulation \(EU\) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation \(2014-2020\)](#)

² [Council Regulation \(EU\) 2021/2085 of 19 November 2021 establishing the Joint Undertakings under Horizon Europe](#)

³ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 28. <https://data.europa.eu/doi/10.2777/17621>

⁴ 5G PPP, The 5G Vision (2015), [brochure-A4-nospread.indd \(5g-ppp.eu\)](#).

⁵ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 28. <https://data.europa.eu/doi/10.2777/17621>

⁶ 5G PPP Progress Monitoring Report – 2022, <https://5g-ppp.eu/wp-content/uploads/2023/08/5G-PPP-PMR2022v3.0.pdf>.

⁷ <https://hexa-x.eu/>, <https://cordis.europa.eu/project/id/101015956/>.

⁸ 5G PPP, The 5G Vision (2015), [brochure-A4-nospread.indd \(5g-ppp.eu\)](#).

industrial capability in communication network technologies⁹ was supported by the 5G PPP's activities, but the partnership's goal to achieve a global market share of over 43% of communication infrastructure was not met¹⁰.

Horizon Europe - SNS JU: Building on the achievements of the 5G PPP, the SNS JU's general objectives¹¹ include:

- to 'contribute to European technological sovereignty across the future smart networks and services value chain';
- 'advance European technological and scientific excellence to support European leadership to shape and master 6G systems by 2030';
- 'contribute to the uptake of digital solutions in the European markets and of digitisation of key vertical industrial sectors';
- 'contribute to the development of digital innovations responding to a 6G EU shared vision'; and
- to 'ensure the alignment of future smart networks and services with EU policy and societal needs, contribute to societal objectives and SDG's' including European Green Deal, network and information security, ethics and privacy, as well as a human-centric and sustainable internet.

The objectives of the SNS JU are well aligned with the main strategic policy goals of the European Union, in particular, the Digital Single Market Strategy, the European Green Deal, and the Industrial Strategy for Europe. The SNS JU ties in closely with the goals of the Horizon Europe programme and some of its key strategic orientations¹². It further contributes to all destinations of Horizon Europe Cluster 4.

While it is too early to fully evaluate the SNS JU's achievements, its performance so far indicates that it is on the right path. An external evaluation found that the SNS JU effectively utilises economies of scale and cross-border effects to surpass the scope of bilateral and national funded collaboration projects. It caters to the needs of the telecommunication industry and various vertical sectors, accelerates technology development, and enables European companies to maintain a competitive position and shape the direction of next-generation mobile technologies¹³.

⁹ 5G PPP, The 5G Vision (2015), [brochure-A4-nospread.indd \(5g-ppp.eu\)](#).

¹⁰ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 26. <https://data.europa.eu/doi/10.2777/17621>

¹¹ SNS JU (2023), *Strategic Research and Innovation Agenda 2021 – 2027*. Available at [sns-ju-sria-2021-2027-second-edition-2023.pdf](#).

¹² Particularly, Key Strategic Orientation A ('Promoting an open strategic autonomy by leading the development of key digital, enabling and emerging technologies, sectors and value chains') and Key Strategic Orientation C ('Making Europe the first digitally enabled circular, climate-neutral and sustainable economy'). See *Horizon Europe strategic plan 2021-2024*, <https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/3c6ffd74-8ac3-11eb-b85c-01aa75ed71a1>.

¹³ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 28. <https://data.europa.eu/doi/10.2777/17621>

The 5G PPP and SNS JU pursue several long-term scientific, societal, economic and technological objectives, focusing on research, innovation and development of 5G and 6G technologies and their deployment in verticals, aiming to provide high-quality networks and services for the benefit of society. As available data shows, the 5GPPP has been successful in delivering on its goals, and the SNS JU, which was only launched in 2021, is considered to be making promising progress thus far¹⁴.

Scientific impact

Scientific excellence: For the 5G PPP, data collected from the public sites of the funded projects shows that they have had a significant impact on the scientific community. For instance, Phase 3¹⁵ projects have produced more than 1900 publications (34% of which were published in scientific journals)¹⁶.

In 2023, SNS projects produced and disseminated knowledge in 129 peer-reviewed articles, 230 conference papers, and 14 white papers. These figures exceed the target of 100 publications¹⁷. This indicates that the SNS JU has an impact on the level of scientific activity and publications, which is a crucial element of Europe's long-term scientific and technological leadership in the sector.

High-risk research funding: Low-TRL activities are considered as high-risk. In the SNS JU, they accounted for 70% of the total funding of call 1 projects¹⁸. The 2023 target was 50%¹⁹. It is expected that low-TRL activities will deliver innovative solutions in the future and allow European companies to spearhead innovation. The figure is not available for the 5G PPP.

Rapid diffusion: More than 100 5G PPP events took place in 2022, including technical workshops, information days and research and innovation events to harmonise the activities of projects and promote their results²⁰. There was no target in the 5G PPP for this value.

The SNS projects that started in 2023 (call 1) reported the organisation of 100 events and workshops, exceeding the target of 25 workshops for 2023. Additionally, they reported

¹⁴ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 5. <https://data.europa.eu/doi/10.2777/17621>

¹⁵ 5G PPP was organised in three phases. Phase 1 focused on basic research to provide the key concepts and solutions for 5G networks, Phase 2 concentrated on system development and bringing this new 5G technology to the vertical industries, and Phase 3 focused on creating large-scale trials and innovation infrastructures as well as basic research activities beyond 5G.

¹⁶ 5G PPP Progress Monitoring Report – 2022, <https://5g-ppp.eu/wp-content/uploads/2023/08/5G-PPP-PMR2022v3.0.pdf>.

¹⁷ Smart Networks and Services Joint Undertaking (2024), Annual Activity Report 2023, https://smart-networks.europa.eu/wp-content/uploads/2024/07/sns-ju_annual_activity_report-2023-ef-esigned.pdf. These numbers are not final as the projects have reported in the context of the SNS-OPS project questionnaire and further processing is underway.

¹⁸ Call 1 refers to the first call launched by the SNS JU, which opened on the 18 January 2022 and closed on the 26 April 2022. There are 35 Call 1 projects.

¹⁹ Smart Networks and Services Joint Undertaking (2024), Annual Activity Report 2023, https://smart-networks.europa.eu/wp-content/uploads/2024/07/sns-ju_annual_activity_report-2023-ef-esigned.pdf.

²⁰ https://5g-ppp.eu/event-calendar/list/?tribe_paged=1&tribe_event_display=list&tribe-bar-date=2022-01-01.

participation in 314 industry events²¹. Overall, the SNS JU helped create and expand an R&I network covering various sectors (application fields and use cases) and the entire value chain²².

Technological impact

Technological innovations: The 5G PPP produced numerous significant technological innovations (key achievements) across its different projects, notably for THz communications, reconfigurable intelligent surfaces and integrated sensing and communications, leading to the creation of related industrial specification groups in the European Telecommunications Standards Institute (ETSI). In 2022 alone, 129 key achievements were reported in Phase 3 projects²³. Key achievements cover nine technical areas, one for business standardisation and regulation, and nine vertical sectors²⁴. Categories include radio access networks; software networks; security, privacy, resilience; vertical experimentation; trials and pilots; transport and logistics; business, standardisation and regulation. No data is available for the SNS JU.

Standardisation contributions: European contributions to standardisation offer several substantial benefits for EU key players, stakeholders and consumers, including a strategic position for European players in the future connectivity market, enhanced interoperability, market efficiency and innovation. Based on the latest figures reported by SNS-OPS²⁵, SNS JU projects have produced 308 contributions to standards by December 2023, exceeding the 2023 target of 50.

Likewise, the 5G PPP has been an active contributor to 5G standardisation globally. Overall, the 5G-IA Pre-Standardisation WG has tracked more than 230 inputs in various organisations. Inputs included technical reports, study/work items, proofs of concept and new commercial requirements²⁶. Most inputs have been submitted to 3GPP and ETSI with a growing number of inputs to IEEE²⁷, and inputs to sector associations working groups like 5GAA²⁸. No target existed for 5G PPP.

Balance between research, innovation, and deployment: In 2023, the SNS JU started Phase 1 of its roadmap with a first batch of 35 projects (29 research and innovation actions (RIAs), 4 innovation actions (IAs) and 2 coordination and support actions (CSAs)) that started by early 2023. The SNS R&I work programme was designed to focus on research activities during its

²¹ Smart Networks and Services Joint Undertaking (SNS JU), Annual Activity Report 2023, https://smart-networks.europa.eu/wp-content/uploads/2024/07/sns-ju_annual_activity_report-2023-ef-esigned.pdf.

²² European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 31. <https://data.europa.eu/doi/10.2777/17621>

²³ Phase 3 Key Achievements 3.2, <https://5g-ppp.eu/phase-3-key-achievements-3-2/#radio>.

²⁴ 5G PPP Progress Monitoring Report – 2022, <https://5g-ppp.eu/wp-content/uploads/2023/08/5G-PPP-PMR2022v3.0.pdf>.

²⁵ <https://smart-networks.europa.eu/csa-s/#SNS-OPS>, These numbers may not be the final ones, as the projects have reported contributions in the context of the SNS-OPS project questionnaire and further processing is underway.

²⁶ 5G PPP Progress Monitoring Report – 2022, <https://5g-ppp.eu/wp-content/uploads/2023/08/5G-PPP-PMR2022v3.0.pdf>.

²⁷ The 3rd Generation Partnership Project (3GPP), the European Telecommunications Standards Institute (ETSI) and the Institute of Electrical and Electronics Engineers (IEEE) are important bodies or associations for standard development, which play a crucial role in defining 5G and 6G standards. Participating in these bodies early on is central to shape standards and define the vision of technologies and their use cases.

²⁸ The 5G Automotive Association (5GAA), <https://5gaa.org/>.

initial phases to shift gradually towards large-scale trials in the final ones, therefore the IA percentage will grow in the final phases. In 2023, 85.7% of funding was allocated to RIAs and 9.5% to IAs.

Economic impact

Market share: While the 5G PPP had set an ambitious target to achieve a global market share of over 43% for European players in communication infrastructure, this goal was not achieved. According to some experts, the target was too ambitious. Reaching it would depend not only on R&D efforts, but also corporate strategy and geopolitical developments²⁹. In 2023, the market share for communication networks was 27.8%³⁰. No target was set for the SNS JU.

Societal impact

While the societal impact of the 5G PPP and the SNS JU remains difficult to measure, the 5G PPP and even more so the SNS JU do include societal aspects. For example, the Hexa-X-II project³¹, the European level 6G Flagship project, a continuation of the Hexa-X initiative funded by the 5G PPP, is a ‘big pillar’ project involving over 40 partners and focuses on sustainability, as well as aspects like user-centricity, user acceptance, and trustworthiness.

Moreover, the importance of meeting societal goals is addressed within a sub-working group within the SNS partnership. This group defined the concept of key value indicators (KVI), which complements the current performance-based approach using key performance indicators (KPIs). KVIs are indications of relevant societal values that can be enabled by future 6G technology and services, and will be used to assess progress toward the goals of safety, security, trustworthiness, inclusiveness and sustainability³².

2. Additionality

With a mobilisation of private investment worth 11 times the EU's public investment, the 5G PPP reached its target of a leverage factor between 5 and 10, set as a business KPI³³. The direct leverage factor remained at the same level under the first two work programmes of the SNS partnership. Participants in the projects funded by Horizon Europe are required to contribute at least a certain proportion of their own funds to the projects. This constitutes a co-investment of public and private investment towards achieving the programme's objectives. Table 1 depicts the most recent data on the partners' financial contribution.

²⁹ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 29. <https://data.europa.eu/doi/10.2777/17621>

³⁰ Smart Networks and Services Joint Undertaking (SNS JU), Annual Activity Report 2023, https://smart-networks.europa.eu/wp-content/uploads/2024/07/sns-ju_annual_activity_report-2023-ef-esigned.pdf.

³¹ <https://hexa-x-ii.eu/>, <https://cordis.europa.eu/project/id/101095759>.

³² European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 31, 41. <https://data.europa.eu/doi/10.2777/17621>

³³ 5G PPP Progress Monitoring Report – 2022, <https://5g-ppp.eu/wp-content/uploads/2023/08/5G-PPP-PMR2022v3.0.pdf>.

Table 1: SNS JU members' contribution and leverage

Expected members' minimum contributions, as per founding Regulation and legal decisions			Actual members' contributions, as of December 2023/June 2024		
EU ³⁴ contribution, in million EUR	Total contributions by partners, in million EUR (of which only cash)	Expected direct leverage factor (of which only cash)	EU contribution, in million EUR	Total contributions by partners, in million EUR (of which only cash)	Direct leverage factor (of which only cash)
900	895 ³⁵	0.99	368	239 (30)	0.65 (0.08)

Source: CORDA (Horizon Europe contribution and costs), eGrants dashboard (other EU contribution and costs), Annual Activity Reports of JUs (for additional activities).

The current direct leverage factor of 0.65 as depicted in Table 1 is below the expected leverage factor of 0.99. Since certification for many in-kind contributions from SNS JU members for 2023 is still pending, it is likely that this value will be higher in following years. According to data provided in the SNS Annual Activity Report 2023³⁶, the total amount of financial and in-kind contributions for the year 2023 amounts to EUR 122 463 655.76. Since the in-kind contributions to operational activities (IKOP) are reported by private members after the end of a project, the first IKOP for SNS JU projects will only be reported by 2026.

3. Transparency and openness

Overall, both the 5G PPP and the SNS JU demonstrate transparency in their implementation and are open to newcomers. In comparison to the 5G PPP, the SNS JU expands the scope and partner composition, encompassing the entire value chain and addressing the demand side more effectively. Newcomers in SNS projects account for 9% of participation (see Table 2), and receive around 6.5% of allocated EU funding.

Table 2: Participation of newcomers in the SNS JU

Participants	Participations	EU funding	Participants %	Participations %	EU funding %
62	81	24 255 571	15.35	9.06	6.52

Source: Data provided by DG RTD based on CORDA data, accessible here: [JU newcomers 20240701.xlsx](#). Reference date 01/01/2024.

The involvement of SMEs was already an important goal of the 5G PPP, and a KPI set a target of 20% of project participations by SMEs. Already in the 5G PPP, an SME working group was established by Networld Europe promoting the skills and expertise of SMEs, especially towards larger companies and research organisations, and on supporting the engagement of SMEs in collaborative projects. SME participation in 5G PPP projects has increased over the years; the original target of 20% was even exceeded, and the share of SMEs ended up at 23%.

As 6G is an even broader technological concept than 5G, involving SMEs from different sectors and expanding the community remains crucial. This is why there were numerous efforts to promote the involvement of SMEs and their capacity to become partners in projects in the SNS JU. Under SNS, the target is also to have 20% SME participation, but efforts to mobilise SMEs have been further strengthened.

³⁴ Includes only Research and Innovation FP contributions, not other contributions that might come from the EU.

³⁵ According to Art. 164 of Council Regulation (EU) 2021/2085, at least EUR 900 000 000.

³⁶ Smart Networks and Services Joint Undertaking (SNS JU), Annual Activity Report 2023, https://smart-networks.europa.eu/wp-content/uploads/2024/07/sns-ju_annual_activity_report-2023-ef-esigned.pdf.

Table 3: Participation from SMEs

	No of SME participations	% SMEs in total participations	Commission contribution to SMEs (million EUR)	% of EU contributions to SMEs
HE - SNS	244	27.29%	39.2	24.35%
H2020 - 5G	349	23.3%	122.3	20.8%

Source for Horizon Europe: Data provided by DG RTD based on CORDA data, accessible here: [JU SMEs 20240701.xlsx](#). Reference date 01/01/2024.

Source for H2020: Technopolis Group, based on CORDA data (reference date HE 19/06/2023, Horizon 2020 15/11/2021)

As shown in Table 3 above, the share of EU funding received by SMEs in SNS projects has increased from 20.8% in H2020 to 24.35% in Horizon Europe. SME participation in the SNS JU was higher than that in other JUs, indicating that outreach and mobilisation efforts have succeeded in involving stakeholders of different sizes³⁷. Despite the successful efforts to address SMEs, some general challenges to their inclusion remain, specifically relating to the administrative burden and the lack of resources for participating in time-consuming calls for proposals.

For the 5G PPP and the SNS JU, the development of strategic research and innovation agendas (SRIAs) has been an important step in expanding the R&I network and ensuring openness to new partners³⁸. The development and updating of the SRIAs was organised by Networld Europe ETP³⁹. The partnership also created a forum for exchange between partners, competitors and other stakeholders who often do not meet and discuss regularly in this way. The SNS JU has already carried out extensive dissemination in conferences, workshops and other events to inform the communities about SNS and the 6G Industry Association (6G-IA). These events have been organised at European, national and regional level.

In the SNS JU, the development and updating of the SRIAs is organised by NetworldEurope ETP and has its roots in the European Technology Platforms (ETPs), established under the seventh research framework programme (FP7). The platform has more than 1 000 members and goes beyond the telecommunications sector. It integrates companies from several industries (verticals) that are relevant for the partnership. There are no barriers (e.g. membership fees) to becoming a member of this ETP. NetworldEurope has a procedure for ensuring participation, with a public consultation to which everyone can contribute. NetworldEurope includes a

³⁷ European Commission (2024), SME participation in Horizon Europe: Key figures (and key issues) in the first three years, doi:10.2777/576670. Based on data from the R&I programmes' monitoring system (CORDA), reference date 1 January 2024.

³⁸ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 40. <https://data.europa.eu/doi/10.2777/17621>

³⁹ NetworldEurope is the incorporation of the European Technology Platform (ETP) for communications networks and services, the follow-up of NetWorld2020, to keep pace with changing EU policies as stated in Horizon Europe. NetworldEurope ETP brings together players in the communications systems sector: industry leaders, innovative SMEs, and leading academic institutions, thus reaching out to a significant part of the European ICT community. <https://www.networldeurope.eu/overview>

scientific committee, which allows it not only to focus on industrial aspects but also to give space to longer-term aspects.

The 5G PPP and the SNS JU have adjusted their SRIAs every 2 years to respond to changes and challenges. The partnership and the developing process of the SRIAs enabled them to cope with changes in the environment. The challenges include geopolitical developments and the emerging demand for sovereignty, which slowed down international coordination and efforts to shape development in this area. For instance, under a previous US administration during the 5G PPP those efforts slowed down with interim consequences for these relationships, and the war in Ukraine influenced global collaboration patterns in the development of 6G technology⁴⁰.

4. Efficiency

Table 4 below reports the total **operational costs** (OC, EU contributions; Validated IKOP; Financial contributions to operational activities by JU partners; Eligible project costs funded by non-JU members to project activities; Contribution from Member States and international organizations to project activities), **certified IKAA** (In-Kind contributions to additional activities) and **running costs** (RC, commitment appropriations EU voted budget and contributions from sources other than the EU) for the period 2014-2023 (the JU has been financially autonomous from end of 2023). See also Annex 4.4.1 for a comparison of operational expenditure and administrative expenditure of Joint Undertakings and EIT KICs of the period 2014 -2023.

Table 4: Operational and administrative expenditures of the JU (source: CORDA database)

*The table includes data for Smart Network & Services Joint Undertaking (the JU has been financially autonomous from end of 2023).
OC: Operational Costs; IKAA: Certified IKAA; RC: Running Costs*

	2014 [EUR]	2015 [EUR]	2016 [EUR]	2017 [EUR]	2018 [EUR]	2019 [EUR]	2020 [EUR]	2021 [EUR]	2022 [EUR]	2023 [EUR]	Total
OC		-	-	-	-	-	-	-	259,074,164	139,176,182	398,250,345
IKAA	-	-	-	-	-	-	-	-	-	107,984,600	107,984,600
RC	-	-	-	-	-	-	-	-	204,599	2,397,882	2,602,481

One main difference between the 5G PPP and the SNS JU is the governance, due to the new form of public-private partnership. While the organisation's form as a JU provides additional opportunities due to its more stable financial funding the disadvantage is that the coordination effort has increased significantly due to the involvement of numerous stakeholders. The administrative tasks also increased at DG CNECT level as more effort and competencies were required, particularly for the initial operations of the JU. In this context, the people in the European Commission responsible for overseeing the JU had to build up expertise in financial, legal and human resources matters.

The SNS JU has been efficient in managing its grants with an average time-to-grant (TTG) of 214 days (see Table 5). TTG is the time from call deadline to the signing of the grant agreement.

⁴⁰ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 37. <https://data.europa.eu/doi/10.2777/17621>

All 63 grants signed by SNS JU up to 1 June 2024 were granted within the TTG target of 245 days or less.

Time-to-inform (TTI) specifies the time from call closure to the date of communicating the evaluation results. With a TTI of 100 days, the SNS JU met the target of 5 months (153 days). Time-to-signature (TTS) is the time from the invitation letter to the signing of the grant agreement. The target is 3 months (92 days), which the SNS JU missed by a small margin with 115 days.

Table 5: Time-to-grant for grants under the SNS JU

	Signed grants	Average time-to-inform TTI	Average time-to-signature (TTS)	Average time-to-grant (TTG)	% below TTG target (less than 245 days)
Totals all JUs	452	110	122	231	81%
SNS	63	100	115	214	100%

Source: Data compiled by DG RTD (extraction date 01/07/2024), to be accessed here: [TTG Dashboard Partnerships.xlsx \(sharepoint.com\)](#)

Needing to cover half the costs of the SNS JU office, the 6G Industry Association (6G-IA) had to increase 6G-IA membership fees to EUR 20 000 for large organisations and EUR 5 000 for SMEs, universities and public research organisations from 2022 onwards. The 5G PPP started with about 50 members and ended with about 100, which also participated in the launch of the new JU. The number of associated members will be just over 300 in 2023.

A drawback of the JU governance and its operational costs perceived by industry representatives is the limited ability of the industrial core members to impose a fee on all benefiting entities⁴¹. Only constituent or affiliated industrial members of the JU pay membership fees to operate the office. However, the legal base of the SNS clearly provides that JU funding must be made available to any entity eligible for funding under Horizon Europe with no entry barriers. As a result, the number of organisations that are funded by and benefit from the programme is significantly higher than the number of constituent or affiliated industrial members of the JU. The aim of the JU is to encourage beneficiaries involved in large or multiple projects who are not yet members to become members of the 6G-IA⁴².

Another identified challenge is the administrative burden and resources associated with participating in calls for proposals, which can present a barrier for SMEs. SMEs may also have difficulty finding a consortium as they often do not have large networks. This issue affects newcomers in particular. Overall, the administrative burden for SMEs has not decreased, especially due to increased reporting duties.

⁴¹ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 27. <https://data.europa.eu/doi/10.2777/17621>

⁴² European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 27. <https://data.europa.eu/doi/10.2777/17621>

5. Coherence and synergies

In the 5G PPP, the 5G for Connected and Automated Mobility WG has been a platform for discussing and sharing information on the Connecting Europe Facility (CEF) Digital programme, specifically focusing on the 5G Corridors deployment plans⁴³. Moreover, work on the Smart Connectivity Digital Innovation Hub Network under 5G PPP contributed to the Digitalisation of the European Industry, which is part of the next Digital Europe programme (DEP), by enabling the adoption of 5G and IoT technologies⁴⁴.

SNS JU has increased synergies with other programmes and is more consistent with them than the 5G PPP was. The SNS works closely with the States' Representatives Group (SRG) and national initiatives through joint events (a special meeting and a convened session at EuCNC (European Conference on Networks and Communications)⁴⁵ 2023 and a dedicated session at the 5G Techritory⁴⁶ event). It also collaborates actively with the SRG through the SNS-ICE project⁴⁷, an information gateway between the EU national initiatives and the SNS JU. The SNS JU also contributes to the coordination of national programmes, including under the Recovery and Resilience Facility and other European programmes and facilities such as the Digital Europe programme (DEP). Overall, the SNS JU puts greater emphasis on exploiting synergies with national programmes than the 5G PPP, most notably via a process facilitated by the States' Representatives Group (SRG).

In addition, according to the most recent BMR survey results (2022), the SNS JU exploits synergies with the Connecting Europe Facility (CEF) and the Digital Europe programme (DEP). It has a strategic role in providing guidance for the relevant programmes under the Connecting Europe Facility, in particular reviewing the Strategic Deployment Agenda (SDA) for 5G for Connected and Automated Mobility and facilitating the establishment of project pipelines. After obtaining the approval of the SNS JU Governing Board in November, and in partnership with the European Commission and industry co-chairs, the SNS JU helped to prepare the launch of the SNS Strategic Working Group on 5G deployment for CAM. This working group brings together industry members and CEF projects participants and reports to the SNS JU Governing Board.

Moreover, the SNS JU is active in engaging the vertical sector, capitalising on the 6G-IA memoranda of understanding (MoUs) with all key global vertical associations (e.g. the 5G Automotive Association (5G AA) and the 5G Alliance for connected industry and automation (5G ACIA)). It explicitly manages collaboration with other associations and groups such as the 5G AA. The SNS-ICE project maintains a detailed verticals cartography with related information from all SNS JU projects.

⁴³ 5G PPP Progress Monitoring Report – 2022, <https://5g-ppp.eu/wp-content/uploads/2023/08/5G-PPP-PMR2022v3.0.pdf>.

⁴⁴ 5G PPP Progress Monitoring Report – 2022, <https://5g-ppp.eu/wp-content/uploads/2023/08/5G-PPP-PMR2022v3.0.pdf>.

⁴⁵ <https://www.eucnc.eu/>

⁴⁶ <https://www.5gtechritory.com/>

⁴⁷ Support action to create a collaborative environment for European and global stakeholders involved in the preparation of 6G smart networks and services, <https://cordis.europa.eu/project/id/101095841>.

Already during 5G PPP, it became clear that, given the pace of technological progress, stronger integration and collaboration with the microelectronics sectors was crucial to successful commercialisation of the technology in the later stages. Therefore, the 5G PPP has established links with the Chips JU through scientific workshops and funded a CSA to establish a roadmap for microelectronics in wireless communications⁴⁸.

Under SNS JU, collaboration with partners from various sectors was further broadened. From the start, the SNS JU aligned its activities with other European partnerships, aiming to exploit synergies with other areas, notably with the Chips JU, HPC, photonics, AI and connected, cooperative and automated mobility (CCAM) partnerships. In 2023, SNS JU developed strong collaboration with the Chips JU, EU-Rail JU and Photonics 21. This collaboration includes synchronised calls between the partnerships based on shared strategic objectives. One example is the development of mobile communication devices which require a strong alignment with the progress and topics defined in the Chips JU partnership⁴⁹.

In the SNS WP 2023, the Chips JU and SNS JUs are launching focus topics as joint and complementary activities in their respective WP, with both communities encouraged to participate in the relevant funded projects. The SNS strand ‘SNS-2024-STREAM-C-01-01: SNS Microelectronics Lighthouse’ will develop a platform where solutions from the microelectronics area will be validated in terms of performance and applicability for 6G networks. The SNS WP 2023 also included a joint call with Rail JU for the development and trials of the Future Railway Management and Control System (FRMCS).

Apart from collaborating with other partnerships, there is alignment with other parts of the main FP and Cluster 4 activities, such as two projects funded dealing with 6G in the main Horizon Europe work programme, which do not belong to the SNS JU WP. Moreover, there are ongoing discussions on aligning SNS JU projects and future Cluster 4 activities relating to the 3Cs (‘Connected Collaborative Computing’) networks⁵⁰. Under Cluster 4, some financial resources were kept as additional budgets for long-term topics, particularly for promoting collaboration between different partnerships or topics positioned between different partnerships. As the SNS JU recognised early on how important it was to address topics in microelectronics, the fast-track was set up to put in place a specific project focusing on microelectronics for telecommunication.

6. EU added value

Both the 5G PPP and the SNS JU provide significant EU added value and contribute to fostering Europe’s technology sovereignty in 5G and 6G and boosting 5G deployment. The partnerships enabled early collaboration among leading European companies, thus securing greater control

⁴⁸ <https://www.corenect.eu>.

⁴⁹ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 24. <https://data.europa.eu/doi/10.2777/17621>

⁵⁰ The White Paper ‘How to master Europe’s digital infrastructure needs?’ (February 2024) envisages the creation of a ‘Connected Collaborative Computing’ Network (‘3C Network’) to set up end-to-end integrated infrastructure and platforms for telco cloud and edge, which could be used to orchestrate the development of innovative technologies and AI applications for various use cases. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=COM:2024:81:FIN>

over key aspects of the technology in the future. The SNS partnership exploits cross-border effects to surpass the scope of bilateral collaboration projects and national funded projects. It caters to the needs of the European telecom industry and various vertical sectors, and it accelerates the development of 5G and 6G technology, enabling European companies to maintain a competitive position and shape the direction of these technological developments. The SNS partnership is in a position to better align its activities more systematically with initiatives and policies on the national level, particularly via the States' Representatives Group (SRG).

Added value of the partnership in compared to the work carried out in Pillar II

The SNS JU has so far been able to generate capacities to exploit economies of scale and cross-border externalities of EU intervention beyond common R&I projects. The partnership has established a platform where companies, research actors and other stakeholders can convene and engage in structured discussions, facilitating interactions that might otherwise not occur regularly. Experts argued that the partnerships made it possible to speed up development against a background of global competition and that the funding had a leverage effect⁵¹. The partnership makes it possible for leading European companies and other institutions to work together early and have control over the key parts of this technology. The 5G PPP worked on the assumption that the telecom industry would create a technology and other industries would adopt it, it became clear that technology, especially in the case of 6G, must be developed in collaboration with vertical industries. The SNS JU takes this into account to meet the needs of the telecom industry (e.g. vendors, telecom operators), but also of verticals, i.e. the users of 5G (e.g. manufacturing industry, transport) in the development of technologies and advanced solutions and applications.

Added value of the partnership compared to interventions at the regional and national level

Promoting competitiveness and innovation in 5G and 6G requires intensive collaboration between key players in different European regions and cannot be achieved simply by coordinating national or regional funding programmes. The SNS JU was able to generate capacities to exploit economies of scale and cross-border externalities of EU intervention, which go far beyond other bilateral collaborative projects or national funded projects. The outcomes of projects funded by Member States are also expected to provide valuable input to SNS JU projects and vice versa. However, a more coherent coordination started only with the SNS JU. In contrast to the 5G PPP, the SNS JU has a higher level of ambition to exploit synergies with national programmes in a process that can be facilitated by the States' Representatives Group (SRG).

⁵¹ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 30. <https://data.europa.eu/doi/10.2777/17621>

7. Relevance

The objectives of the 5G PPP and SNS JU are aligned with the policy objectives of the Horizon Europe framework programme to ensure relevance and adaptation to technological trends. The main differences between Horizon 2020 with the 5G PPP and Horizon Europe with the SNS JU are: i) the scope of technologies and sectors; ii) the directionality; and iii) the governance due to the new form of public-private partnership.

The main objectives of the SNS JU, according to the first SNS JU WP⁵², are:

1. to reinforce European leadership in the field of next-generation network technologies (6G), connected devices and services while accelerating European digital industry uptake and the digitisation of economy and society; and
2. to position Europe as a lead market and positively impact people's quality of life by supporting key Sustainable Development Goals (SDGs) while boosting the European data economy and helping to ensure European sovereignty in these critical supply chains.

In addition to maintaining a solid European industrial leadership position in mobile telecommunications, it has become important to secure sovereignty beyond the conventional drivers of a competitive industry, especially for the SNS JU. Policymakers identified this need early on in relation to the design of the SNS JU and the advancement of the next-generation telecommunications infrastructure⁵³. Mobile telecommunication was an important domain within the ICT sector, but it was not as strategic as it has become lately due to geopolitical developments. Since around 2015, policy and industry have recognised the strategic significance of this infrastructure and of dependency on China. According to industry experts, the joint undertaking form has the potential to leverage Europe's strategic influence and impact globally, for instance via its efforts to shape standardisation processes and by fostering technological innovation in Europe⁵⁴. Considering the relevance of digital infrastructure and technological innovation for European sovereignty and competitiveness, the objectives of the SNS JU are highly relevant – and increasingly so – for the EU.

The Strategic Research Innovation Agendas (SRIAs) for the 5G PPP and the SNS JU are the main instruments for the long-term planning of the partnership's technological development and have proved flexible enough to adapt to emerging trends. Although the SRIAs look ahead to the long-term development of 5G/6G technologies and applications, they should not be seen as fixed long-term plans. By defining development goals and themes, the SRIAs, updated every 2 years, helped the industry to reduce uncertainty and allowed long-term commitments to be

⁵² SNS JU (2020), SNS R&I work programme 2021-2022, https://smart-networks.europa.eu/wp-content/uploads/2022/10/snsriworkprogramme20212022_ckvqrabs7gkb08dhgl6wh73cwqa_82061-6.pdf.

⁵³ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 15. <https://data.europa.eu/doi/10.2777/17621>

⁵⁴ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 17. <https://data.europa.eu/doi/10.2777/17621>

made⁵⁵. According to stakeholders, the process of adapting the SRIAs to the needs of stakeholders is considered to be ‘dynamic’⁵⁶. This relates to the organisation, people and consultations.

Further, the SNS JU regularly consults with stakeholders and Member States to adapt and further develop its objectives and activities. Member States’ feedback is primarily gathered via the States’ Representatives Group (SRG), while workshops with industry stakeholders and experts provide an opportunity to take their views on board. The SNS JU Policy Working Group also collects stakeholder opinions on various relevant topics, including policy, industrial and business developments, and emerging trends. After internal discussions among the Industry Association members, the work programme is negotiated with the European Commission and the Member States. These processes have proven flexible enough to adapt to emerging developments through swift coordination and exchanges, while at the same time providing direction.

8. Directionality

The objectives of the SNS JU align with the EU's macro-level objectives, such as sustainable economic growth, strategic autonomy, the Green Deal, and specific SDGs, with a focus on societal goals and key value indicators to validate the contribution of 6G technology for the EU and its citizens. While the main focus of the 5G PPP was competitiveness, Horizon Europe and the SNS JU put an additional emphasis on policy objectives such as strategic autonomy, sustainability, privacy and security⁵⁷.

The ‘European Vision of the 6G Network Ecosystem’⁵⁸ emphasises a human-centric approach and end-user engagement, aiming for technological sovereignty, advanced 6G ICT solutions, transformation of the EU digital value chain, and alignment with EU policy and societal needs. While the SNS JU has not yet collected key performance indicators to assess its progress, experts view the progress achieved as positive⁵⁹.

The SNS JU has brought together European actors, generating a catalytic effect and establishing a recognised focal point for 6G developments globally. However, there is a need for a clearer technological strategy, especially in cloud technology. The current approach is rapidly evolving

⁵⁵ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 22. <https://data.europa.eu/doi/10.2777/17621>

⁵⁶ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 22. <https://data.europa.eu/doi/10.2777/17621>

⁵⁷ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 32. <https://data.europa.eu/doi/10.2777/17621>

⁵⁸ <https://5g-ppp.eu/european-vision-for-the-6g-network-ecosystem/#:~:text=Key%20features%20of%206G%20will,trustworthy%20infrastructure%2C%20scalability%20and%20affordability>

⁵⁹ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 33. <https://data.europa.eu/doi/10.2777/17621>

and raises concerns about reliance and effectiveness, although the JU is taking a proactive stance to initiate global discussions.

9. International positioning

International collaboration and geopolitical developments significantly influence the development of 5G and 6G technologies. International cooperation has been strengthened under the SNS, with discussions about developing a global ecosystem for 6G to ensure interoperability and avoid regional fragmentation, as seen in the 5G development process. More generally, the SNS JU is recognised globally as a focal point for 6G development, with its private member (6G-IA) signing MoUs with third countries, such as Japan, the US, China, Korea and India⁶⁰.

The SNS JU also has a dedicated Coordination and Support Action (CSA) project aimed at creating synergies with other regions. Additionally, there are specific topics in the work programme for bilateral collaborative projects, for example, with the US. Furthermore, aligned topics with Japan and Korea are part of the SNS 2024 work programme, with further international cooperation activities planned. In the 2023 work programme, the SNS JU actively engaged with the United States on topics related to AI and future networks. To support this cooperation, the project 6G-XCEL⁶¹ was launched in 2023.

The SNS JU further facilitates cooperation between projects through workshops and information exchange. The SNS JU is also involved in and supports major international events, such as the European Conference of Networks and Communications.

10. Phasing-out preparedness

According to the Single Basic Act, all Joint Undertakings have the legal obligation to adopt a plan for the phasing-out of the partnership from Horizon Europe funding by the end of 2023. The aim of the plan is to ensure a smooth continuation of the JUs' activities in the scenario of no funds available under the next Framework Programme. In this perspective, JUs are asked to perform an in-depth reflection on a phasing out strategy leading to a lesser dependence from the Union contribution.

SNS JU has prepared a preliminary plan which was adopted by its Governing Board in December 2023. The preliminary plan included administrative and operational adaptations, which should allow the JU to proceed its activities in case of no Union funding under the next Framework Programme. In detail, the adaptations concern several aspects, such as legal status, staffing, accounting and cashflow, procurement, logistic and IT, follow up of the grant agreement obligations after the end of projects.

The drafting of the updated phasing out plan is currently ongoing and it is planned to be adopted in 2025. It should include concrete reflections on short- and long-term targets, strategic

⁶⁰ European Commission: Directorate-General for Research and Innovation, *Institutionalised partnership report – Smart Networks and Services (SNS) joint undertaking*, Leitner, K.-H. (author). Publications Office of the European Union, 2024, p. 33. <https://data.europa.eu/doi/10.2777/17621>

⁶¹ <https://www.6g-xcel.eu/>, <https://cordis.europa.eu/project/id/101139194>.

alignment and financial sustainability. The aim is to develop a strategy enabling the JU to obtain the objectives beyond the duration of the Union's participation.

In detail, to ensure continuity, the JU Office is exploring possibilities for a potential successor project, most likely also considering the results of a further impact assessment study. Efforts are already being made to establish programme-level structures, such as working groups, which may continue beyond the partnership's duration. The sustainability of these structures will depend on their ability to be self-sustaining and coordinate ongoing efforts. Considering the continuous evolution of standards, with 5G standardisation ongoing and the start of 6G standardisation, there will quite likely be a strong case and need for continued investments in standardisation challenges. If there is a significant shift in the landscape where standards become less critical in telecom or other domains like AI, alternative approaches can be considered.

In the next years, the phasing-out plan will be further developed and the SNS JU will produce a more detailed document upon advice from the European Commission, inputs from its private member, the 6GIA and in collaboration with the other Programme stakeholders to refine the phasing-out plan and monitor and report on its progress.