Strategies and Recommendations for Global Consensus and EU R&D Cooperation in 6G

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The Smart Networks and Services Joint Undertaking (SNS-JU) is leading Europe's 6G research from 2023 to 2030 through phased R&I projects focused on new technologies, testing facilities, and global collaboration. The SNS-ICE CSA project acts as an international ambassador, promoting partnerships, publishing position papers, and aligning Europe's goals with global 6G efforts. This paper presents SNS-ICE's strategy for global consensus and R&D cooperation, highlights links with other EU programs, and offers recommendations to support open technologies, competitiveness, and international collaboration for a unified 6G ecosystem.

I. Introduction

The Smart Networks and Services Joint Undertaking (SNS-JU) leads Europe's 6G efforts through phased R&I projects (2023–2030), focusing on advanced technologies, experimentation, and global collaboration. The SNS-ICE CSA connects these efforts with international 6G initiatives via three pillars: International Collaboration, EU Research Environment, and Vertical Engagement. Through position papers and roadmaps, it promotes Europe's 6G vision while aligning with global standards. Synergies with EU programs like IPCEI-CIS (Important Project of Common European Interest on Cloud Infrastructure and Services), DEP (Digital Europe Programme), and CEF (Connecting Europe Facility) bolster Europe's telco-cloud and infrastructure capabilities, reducing dependency on external technologies and ensuring competitiveness. Finally, the elaboration of the 2025 SNS Work Programme has adopted a stakeholder-driven approach, ensuring consensus and alignment with industry and research needs. This paper outlines SNS-ICE's strategy and provides recommendations to boost EU leadership and shape a unified global 6G framework.

II. SNS-ICE/6G IA's approach to consensus building

The SNS-ICE [1] consensus-building strategy is structured around two pillars: promoting European positions through publications and fostering international and European collaboration in defining and executing R&I work programmes. In 2024, several activities advanced these goals.

a) **Key Strategies for 6G: 6G-IA Position Paper v2.0:** SNS-ICE members, active within the 6G-IA (6G Smart Networks and Services Industry Association), contributed to the updated Vision Paper [2] highlighting 6G advancements like native AI, ISAC, and advanced cybersecurity, while addressing sustainability and 5G limitations. The paper has been widely disseminated through webinars, social media, and major events like EuCNC and IEEE conferences.

b) **International Collaboration in SNS R&I Work Programme:** Joint R&I efforts included projects with the US (6G-XCEL), South Korea (6GARROW), and Japan (6G-MIRAI), focusing on AI-driven architectures, RAN-core integration, and open RAN. Call 2025 will pause direct international funding to reassess strategic priorities, instead promoting lighter cooperation, notably via US subsidiaries in Stream B projects.

c) **Synergies with IPCEI-CIS and Cluster 4:** To reduce tech dependency, SNS-JU promotes telco cloud solutions via collaborations with IPCEI-CIS and Cluster 4. A 2024 Stream C call targets 6G telco cloud enablers, and SNS-JU has taken a coordinating role as suggested in [3], launching the Policy WG on 3C networks to unify efforts.

d) **Liaison with DEP and CEF:** SNS-ICE works with DEP and CEF to ensure coordination and avoid overlaps. Through Digital Innovation Hubs (DIHs), the project supports 5G uptake with services and webinars. CEF investments back infrastructure like 5G Corridors. The 6G-IA also leads working groups such as one focused on Connected Automated Mobility (CAM).

III. Alignment with other European R&I Initiatives related to the SNS JU Work Programme

In April 2024, SNS-OPS, supported by SNS-JU and DG-CNECT, hosted a series of Strategic Consultation Workshops in Brussels. SNS-ICE played a key role, contributing experts and chairing sessions such as the wireless communication technologies workshop. The workshops, the scope of which is shown in Table I below, were aimed to (i) Define 6G research priorities and structure them across short- (2025), medium- (2026), and long-term (2027) goals; and (ii) Identify synergies with other initiatives (e.g., JUs, PPPs, IPCEIs, national programs) over the next three years.

Participants pre-identified top research topics, current TRL levels, expected TRL progression, synergies, and missing topics in current SNS coverage. Coordination with other initiatives followed four main approaches:

- Full topic coverage by external initiatives (e.g., ESA, Chips JU), with limited info exchange;
- SNS offering system-level requirements while receiving component-level input from others;
- Shared use of pilots/trials, joint stakeholder participation;
- Mutual participation in calls and coordination of call topics.

TABLE I: WORKSHOPS ON 6G RESEARCH PRIORITIES ORGANIZED IN BRUSSELS.

Scope	Synergistic work programmes/initiatives
Photonics	Photonics 21, Chips JU, European Space Agency (ESA).
Non-terrestrial Networks	European Space Agency (ESA)
Security	European Cyber Security Organisation (ECSO), IPCEI-CIS, Quantum Flagship, European Cybersecurity Competence Center
Wireless communication technologies & signal processing	Chips JU
Cloud and service provision	IPCEI-CIS, Cluster 4 (Large Scale Trials on end-to-end infrastructure; advanced computing and big data).

The next subsection summarizes the main changes in the SNS R&I Work Programme 2025 [4] stemming from the organisation of those events.

A. *Impact in the SNS R&I Work Programme 2025*

The overall structure of the SNS R&I Work Programme 2025 remains largely consistent across Streams B, C, and D, but introduces several key enhancements aligned with new EU policy goals, the start of 6G standardisation in 3GPP, and outcomes from recent SNS workshops. Key changes include:

- **Stronger focus on standardisation and PoCs**: Stream B and C projects now emphasize higher-TRL outputs with tangible impact on standardisation, particularly via ETSI and open-source initiatives.
- **Early-stage disruptive tech exploration**: Stream B-01 will fund small projects to explore novel 6G technologies beyond 2030, starting at TRL 1–3.
- **New 6G telco cloud project**: Stream C introduces a pan-European R&D platform supporting open-source efforts like GSMA Open Gateway and Sylva, aiming to reduce reliance on non-EU solutions.
- **Front-End Module (FEM) initiative**: A new project targets mid-band (FR3) development, with potential follow-up in the Chips JU, to support EU-driven hardware innovation.
- **Refocused vertical trials**: Stream D will now support smaller, vertical-specific trials tied to 6G monetisation and use cases from the 2024 3GPP SA1 Workshop.
- **Terrestrial/non-terrestrial network integration**: Deeper integration is promoted through shared technologies and interfaces to support advanced use cases like Direct-to-Device and PPDR.

IV. CONCLUSIONS AND RECOMMENDATIONS

The global 6G ecosystem is accelerating, with 6G-IA—via the SNS-ICE project—playing a central role in Europe by fostering collaboration across research, industry, and verticals. Through widely shared position papers and roadmaps, Europe's 6G vision addresses key societal and technological challenges while promoting international dialogue.

International R&I projects like 6G-XCEL, 6GARROW, and 6G-MIRAI strengthen global ties and boost EU competitiveness, supported by initiatives such as IPCEI-CIS and Cluster 4. Coordination with DEP and CEF ensures a cohesive digital infrastructure strategy.

From the insights gained from SNS-ICE's work, the project has derived a set of **recommendations** for key stakeholders:

SNS Office, Public Sector & Policymakers:

P1. *Invest strategically*: Prioritize funding for initiatives like IPCEI-CIS to reduce reliance on non-EU cloud providers, support data sovereignty, and expand connectivity in underserved areas.

P2. *Boost international collaboration*: Integrate global R&I partnerships into SNS Work Programmes to balance sovereignty with innovation, ensuring mutual commitment to reduce risks of autarky.

P3. *Coordinate telco-cloud efforts*: Assign 6G-IA a leading role in orchestrating telco-cloud and advanced computing initiatives under Cluster 4, IPCEI-CIS, and SNS.

Telecom Industry:

I1. *Champion open, interoperable solutions*: Promote competitiveness and avoid vendor lock-in. *Invest in frontier technologies*: Focus on AI-native networks, Terahertz, and edge-cloud to deliver low-latency, high-reliability services.

I2. *Disseminate Europe's vision*: Use position papers and roadmaps to highlight Europe's 6G priorities globally and build consensus.

Academia & Research:

R1. *Align with global goals*: Focus on sustainability, AI, and ISAC, while addressing European needs.

R2. *Collaborate with industry and SMEs*: Turn research into market-ready innovations through partnerships.

SMEs:

S1. *Innovate in niche areas*: Target AI-driven network intelligence and privacy protocols.

S2. *Join collaborative projects*: Engage in OpenRAN and SNS-JU efforts to scale innovation.

S3. *Use replicability tools*: Scale successful innovations across EU markets.

Cross-Sector Collaboration:

C1. *Strengthen Public-Private Partnerships*: Use SNS-JU frameworks and working groups to align efforts.

C2. *Coordinate global representation*: Ensure unified and strong European presence in global 6G standardization.

By following these recommendations, Europe can reinforce its leadership and contribute to a globally harmonized 6G standard.

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