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D3.1 Report on Liaisons Activities

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Abstract	This document reports the main liaisons and synergies created within the SNS JU context and beyond by establishing connections, exchanging know-how and organising common events, webinars, panel discussions, etc.
Keywords	liaison activity, synergies, collaborations

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DISCLAIMER

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EXECUTIVE SUMMARY

This document reports the main activities and results of 6G4Society during the first 14 months, focusing on Task 3.1, which aimed to establish liaisons, create synergies, and align project objectives and work plans with other SNS JU projects (CSAs and R&I) and initiatives.

Due to delays in the SNS JU Collaboration Agreement, the 6G4Society consortium did not have direct access to documents nor Working Group activities until project month six. Despite this, the consortium established productive collaborations with numerous projects and working groups, effectively mitigating the initial delay.

Drawing on the consortium's expertise (gained through various work packages and tasks, as well as partners' prior involvement in SNS JU working groups and Phase 1 activities), we developed and implemented an effective action plan in close collaboration with key players in the SNS JU ecosystem. These players included the SNS JU Office, the Sustainability Task Force, other CSAs (such as SNS OPS and SNS ICE), several RIAs, and various working groups. From the beginning this multistakeholder approach has brought visibility within the SNS JU community and outside to non-expert communities, related cloud, edge, AI and IoT projects and our Expert Advisory Board.

Given 6G4Society's scope and ambition, our initial focus was on connecting and cooperating with initiatives within and beyond the SNS JU context. We highlighted the societal dimensions of technological development and promoted our work on Key Value Indicators (KVIs), standards, and a human-centric approach. Our goal is to integrate sustainability, ethics, and acceptability into the design and conception phases.

Within the SNS JU ecosystem this approach is no longer seen as something ‘nice to have’, as within the technical architectures more and more attention is paid to sustainability beyond energy efficiency and the societal context in which the next wave of connectivity is being developed.

We established connections with external initiatives (beyond SNS JU) through webinars, expert sessions, events, monitoring, document review, and the establishment of an external Expert Advisory Board.

Within WP3, our activities focused on:

- Understanding and positioning the project within the complex and evolving SNS JU ecosystem.
- Engaging with relevant projects, working groups (both 6G-IA and SNS JU), organisations, experts, and initiatives beyond SNS JU.
- Building connections (including outside SNS JU) to share knowledge, compare results, discuss challenges, and increase impact.

The document concludes with information on activities planned for the future, which will focus on engaging with relevant initiatives across European Member States.

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ABBREVIATIONS

5G	Fifth generation mobile network
6G	Sixth generation mobile network
AI	Artificial Intelligence
AR	Augmented Reality
CEW	CEN Workshop Agreement
CSA	Coordination and Support Action
DG CONNECT	Directorate General Content, Networks and Technology of the European Commission
DMP	Data Management Plan
DoA	Description of Action
EC-GA	European Commission Grant Agreement
GDPR	General Data Protection Regulation (EU 2016/679)
ICT	Information and Communication Technologies
IoT	Internet of Things
KPIs	Key Performance Indicators
KSIs	Key Sustainable Indicators
KVs	Key Values
KVIs	Key Value Indicators
MS	Member States
NDT	Network Digital Twins
SAT	Social Acceptance of Technology
SNS-JU	Smart Network System - Joint Undertaking
SNVC	Societal Needs and Value Creation
TC	Technology Committee

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1 INTRODUCTION

6G4Society is a Smart Networks and Services Joint Undertaking (SNS JU) project which aims to ensure that societal and sustainable values are properly embedded into the development of 6G technology, bringing a sociological perspective to technological development.

6G4Society should define how digital technology could support the sustainable environmental dimension of the transition by answering the question: *How do we make 6G networks more sustainable (beyond energy efficiency) and how do we consider sustainability in a more holistic way?*

The importance of the project also lies in the fact that it is the first time that societal issues and ethical considerations are developed alongside with the technical reference architectures and planned development. Value, Key Value Indicators and Social Acceptance indicators are investigated within the SNS JU and outside as we explored models for public trust, participatory democracy, and lessons from 5G adoption and citizen feedback surveys.

This document provides a comprehensive overview of the liaison activities at the 6G4Society project (January 2024 - February 2025). It details how key stakeholders within the SNS JU framework have been identified and engaged through a series of workshops, webinars, interviews and surveys. The overall aim of the activities have been to foster synergies and ensure alignment of objectives across various initiatives by bringing attention to the societal dimensions linked to technological development and make the SNS projects aware of our work on Key Value Indicators (KVIs), standards, and human-centric approach, so to facilitate the integration of sustainability, ethics, and acceptability values by design and by conception.

Synergies with these projects are strategic as a groundwork of our activities where we are aiming at presenting the Social Acceptance and Technology framework (SAT), the KVI-KSI frameworks, engaging with them, obtaining feedback from stakeholders, or presenting communication material for non-experts. The primary beneficiaries of these synergies and related activities include both direct stakeholders—such as policymakers, technology developers, and industrial players—and broader societal groups, including public administrations, academic institutions, and, of course, citizens. These groups stand to gain from the project's focus on creating a value-based and socially aligned framework for 6G adoption.

Furthermore, this activity contributes to the SNS JU objective of conceiving and developing a European value-based approach to 6G, emphasising alignment with global standards, such as those set by the ITU and 3GPP. European KVIs and KPIs integrate benchmarks that resonate with these global frameworks, ensuring a coherent and unified path in the international 6G standard-setting process.

The document sets the strategic and forward-looking roadmap for future activities, by focusing on deepening cross-sectoral collaboration and outlining plans to integrate societal values and sustainability into the evolution of 6G technologies. By reporting on current achievements and mapping out future collaborations with both SNS projects and Member States, it also serves

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as both a record of progress and a guide for aligning research, innovation, and societal impact within the broader SNS JU ecosystem.

The rest of this deliverable is organised as follows:

- **Section 2: Stakeholder Mapping: The SNS JU context**

  This section provides a detailed mapping of the main stakeholders within the SNS JU framework. It outlines the range of collaborative activities which have been carried out at the first year of the project (such as workshops, webinars, and circulation of an SNS survey) and sets the stage for new initiatives and activities- including interviews- to be pursued in the coming year.

- **Section 3: Landscape Analysis and Stakeholder Research**

  This section describes our combined approach of desk research and direct engagement which provided a robust foundation for identifying potential partners and shaping our collaboration strategy. We report on the main liaisons and collaboration activities such as desk search, surveys, info gathering, study and analysis, collaborations with selected SNS JU projects, interaction via existing 6G IA and SNS JU Working Groups and collaborative organisation of events (online and offline).

- **Section 4: Collaboration and Knowledge Exchange beyond the SNS JU**

  This section focuses on the project's active engagement in liaison activities designed to foster strategic alignment with relevant research, innovation, policy, and regulatory initiatives across Europe, as well as strategies to engage with Member States by mapping national initiatives and exploring how to align them with the project's broader objectives by emphasising the need to integrate societal and sustainability considerations into Europe's 6G development framework.

- **Section 5: Future Planned Activities**

  This section presents a forward-looking agenda of planned activities, including webinars, workshops, and collaborative initiatives to drive 6G research. It lays out the strategic roadmap for aligning technical developments with societal impact and sustainability goals. Among our lessons learned are foremost that strategic engagement such as in SNS OPS and SNS ICE, is essential and that stakeholder involvement drives our impact.

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2 LIAISONS AND COLLABORATIONS APPROACH

At the project's start, it was crucial to understand and map the various stakeholders, projects, working groups, and task forces within and beyond the Smart Networks and Services Joint Undertaking (SNS JU) context. This mapping exercise was fundamental for identifying potential collaborations and liaisons to achieve project objectives and maximise its impact. Although the landscape of relevant players is constantly evolving, to identify key actors and initiatives was a prerequisite to establish lasting, effective synergies.

2.1 STAKEHOLDER MAPPING - THE SNS JU CONTEXT

Stakeholder mapping is central to the 6G4Society's approach to 6G, informing its design, development, governance, and eventual adoption. The project prioritised alignment with EU strategic priorities and values, including sustainability, societal inclusion, trustworthiness (specifically privacy and data protection), and collaborative partnerships.

In this respect, the 6G4Society consortium collaborated with many of the ongoing Call 1 and Call 2 projects from the SNS Stream B, C, and D.

- **Stream B – Research for Radical Technology Advancement**: Focuses on fundamental research and sustainability-driven innovation.
- **Stream C – Experimental Infrastructures and Platforms**: Supports testing and validation of emerging 6G technologies.
- **Stream D – Large-Scale Trials and Pilots with Verticals**: Demonstrates real-world applications in key sectors.

Figure 1: The SNS JU Evolution

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OBSERVATIONS:

- 6G4Society is a Phase 2 project, therefore when we started, only Phase 1 projects had already been active for about one year. All Phase 2 projects basically started at the same time we did.
- The direct and official engagement of Phase 2 projects within the SNS JU ecosystem, including participation to SNS JU Working Groups and Task Forces, was not possible until June 2024, because of the delay in the SNS JU Collaboration Agreement.
- Given the different timeline and maturity of the work conducted by different projects, the kind of collaborations we established with them had to be adapted to the specific situation.
- The SNS JU ecosystem is quite articulated with several SNS JU Working Groups and Sub Working Groups, and 6G-IA Working Groups that are only open to 6G-IA members.
- Phase 3 projects started at the beginning of 2025, but we have already started discussions with some of them, like for instance 6G-SUSTAIN.

2.1.1 KEY STAKEHOLDER GROUPS

6G4Society emphasises a holistic stakeholder engagement framework, ensuring that 6G technology is developed ethically, inclusively, and in alignment with societal values. By mapping key actors across the ecosystem, this framework fosters transparency, collaboration, and sustainable innovation in defining future network architectures and applications. The stakeholder mapping presented below illustrates the diverse ecosystem contributing to the design, development, deployment and standardisation of 6G.

Notice, this map has been created as an instrument of work for our consortium, based on the existing SNS JU ecosystem map produced by the SNS OPS project, but extending it and complementing it considering the specific ambition of 6G4Society - see Appendix 1.

1) **General Public, Experts, Influencers, and Media:** This group includes various stakeholders such as non-experts, researchers, policymakers, media representatives, each of them playing a vital role in knowledge sharing and ensuring broad engagement and shaping public perception about 6G development.
2) **Policy and Financing Bodies:** This category comprises EU institutions, governmental and international regulatory entities and funding bodies, which provide strategic oversight and provide financial support for 6G initiatives.
3) **Standardisation and Open-Source Organisations:** This group includes standardisation bodies and open source platforms that collaborate to establish industry standards and foster innovation through collaboration.
4) **SNS User Ecosystem:** This category encompasses SNS JU projects and associated initiatives driving 6G research and development, emphasising collaboration, shared learnings and drive joint efforts within the SNS JU framework.
5) **5G/6G Industry, Research, and Verticals:** This category gathers key industrial players, academics, representatives from vertical sectors driving the commercialisation and application of 6G technologies across various industries, such as healthcare, energy, smart cities, mobility, etc.

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6) **5G/6G Non-SNS Complementary National, European, and Global Organisations:** Comprises international collaborations and complementary domain-specific organisations to foster cross-border and essential interdisciplinary collaboration.

7) **Related Activities and Synergies:** Focuses on initiatives and collaborative efforts at both EU and global levels that create strategic synergies to support and expand the 6G ecosystem.

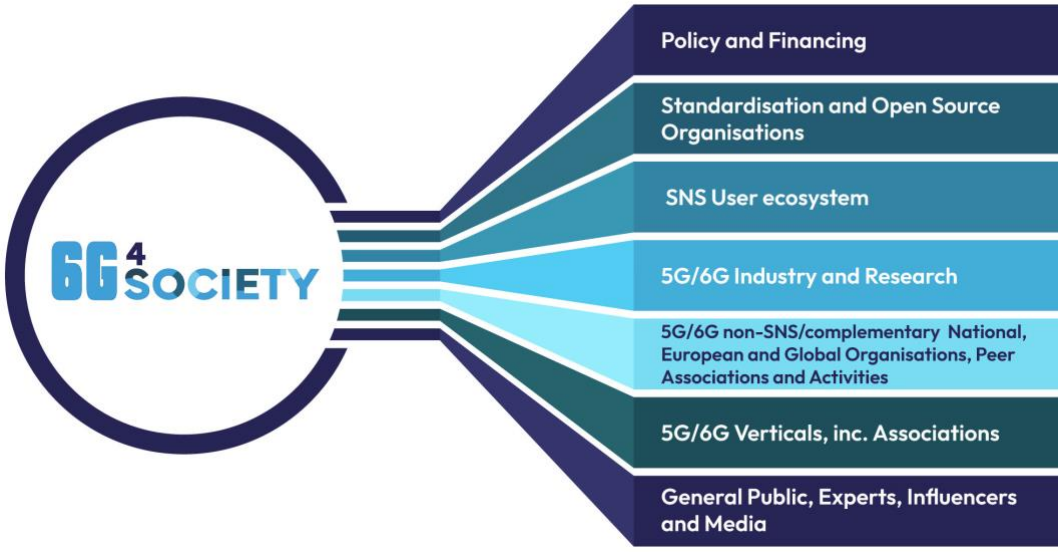

Figure 2: Key Stakeholder Groups

2.1.2 STAKEHOLDER ENGAGEMENT APPROACH

The 6G4Society project integrates stakeholder engagement through:

Public Awareness and Education: 6G4Society recognises the importance of informed public discourse surrounding 6G technology. We engage in targeted outreach activities to educate non-expert audiences about both the potential benefits and the potential risks associated with 6G (see in particular several activities led by WP2). This includes simplifying complex technical information, addressing public concerns, and fostering a balanced understanding of 6G's societal implications. Examples of these activities might include public forums, plain-language publications, and educational resources disseminated through various channels. This ensures that public perceptions and societal values are considered in the development and adoption of 6G.

Multidisciplinary Collaboration: Building a robust and responsible 6G ecosystem requires diverse perspectives. 6G4Society fosters multidisciplinary collaboration by bringing together technical experts (engineers, researchers), legal professionals (experts in data privacy, regulation), social scientists (experts in human-computer interaction, societal impact), and economists (experts in market analysis, innovation). This collaborative approach ensures that the development of 6G is not solely driven by technological advancements but also considers the legal, social, and economic implications, leading to a more holistic and well-rounded approach. This collaboration occurs through workshops, joint research projects, and ongoing dialogue, but also via direct engagement with the external Expert Advisory Board (Task 5.1) representatives we have engaged in several ways.

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Standardisation and Policy Input: 6G4Society actively contributes to the development of 6G governance frameworks by providing input on standardisation and policy. We produce work to ensure that societal needs and ethical considerations, such as data privacy, security, and accessibility, are embedded in the standards and regulations that will shape the future of 6G. Namely, the general expected outcome of 6G4Society is to inform, based on scientific evidence, relevant stakeholders from the European ecosystem (national and EU policymakers, EU agencies, DGs, etc.) and the broader public on the current and upcoming strengths, challenges, and opportunities supporting the relevant European ambitions delineated by the European Commission regarding 6G. This involves participating in standardisation bodies, contributing to policy discussions, and providing research-based evidence and recommendations to policymakers. Our goal is to influence the direction of 6G development, so it aligns with societal values and promotes responsible innovation. This included active engagement with key Working Groups under SNS JU and 6G-IA, like the Pre-Standardisation WG, to create liaisons and explore pathways to advocate for the early integration of value considerations into 6G standards. A significant result is the ongoing development of the KVI/KSI Ontology, a structured framework that systematically captures the established key societal and sustainability indicators, with the target of positioning them as not just abstract concepts but traceable and interoperable elements within 6G standardisation. Communication with a major standardisation body, ETSI, was attempted, with views of contributing the Ontology work and potentially the KSI framework into a Technical Committee (TC). This communication channel faced challenges, because the TCs have rigorous procedures and mainly technical orientations. Further work is ongoing in attempting contribution to the SAREF Ontologies framework inside ETSI, which aligns with the project's projected Ontology outcome. However, participation in events like the ITU-ETSI Symposium on ICT Sustainability facilitated discussions on embedding sustainability metrics in 6G governance. The Pre-Standardisation Roadmap identified key stakeholders and mechanisms, such as the CEN Workshop Agreement (CWA), to formalise the KVI/KSI ontology as a recognised pre-standardisation document. Moving forward, the focus is on refining the Ontology based on further establishment of a common set of KVIs, submitting the ontology for CWA endorsement, and continuing collaboration with certification and regulatory stakeholders to promote a human-centric and responsible 6G ecosystem.

Open Innovation and Open-Source Contributions: 6G4Society champions open innovation and open-source contributions as key drivers of technological advancement. We believe that community-driven development fosters greater transparency, accelerates innovation, and ensures that the benefits of 6G are accessible to a wider range of stakeholders. We encourage participation from researchers, developers, and other stakeholders through open-source projects, collaborative platforms, and public competitions. This collaborative approach fosters a dynamic and inclusive 6G ecosystem.

Sustainability and Societal Readiness: Recognising the critical importance of sustainability, 6G4Society aligns 6G development with key sustainability indicators (KSIs) and responsible research principles. We investigate the environmental impact of 6G technologies and promote practices that minimise energy consumption and resource utilisation. Furthermore, we address broader societal readiness by considering the ethical, social, and economic implications of 6G, ensuring that the technology is developed and deployed in a responsible and sustainable manner. This includes examining potential societal disruptions and developing strategies for mitigating negative impacts and maximising the positive contributions of 6G.

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3 LIAISONS AND COLLABORATION ACTIVITIES

6G4Society champions sustainable, inclusive, and socially accepted 6G technology. By actively participating in SNS initiatives, workshops, and knowledge sharing, the project promotes a human-centric, ethical, and environmentally sound approach to 6G development. Future efforts will focus on strengthening partnerships and using research to shape policy, standardisation, and the real-world implementation of sustainable 6G networks.

In the remainder of this section, we report on the main liaisons and collaboration activities run so far on various fronts.

- Desk search, surveys, info gathering, study and analysis.
- Liaisons and collaborations with selected SNS JU projects.
- Interaction via existing 6G IA and SNS JU Working Groups.
- Collaborative organisation of events (online and offline).

3.1 LANDSCAPE ANALYSIS AND STAKEHOLDER RESEARCH

Effective collaboration requires a thorough understanding of the existing landscape. To lay the groundwork for impactful liaisons and collaborations, 6G4Society undertook a comprehensive information-gathering phase. This involved both passive and active research methods. Passively, we conducted extensive desk research, analysing publicly available documents, reports, and publications related to 6G technology, relevant initiatives, and stakeholder activities. Actively, we engaged with key actors through surveys, interviews, and targeted information gathering exercises to gain direct insights into their perspectives, priorities, and ongoing work. This combined approach of desk research and direct engagement provided a robust foundation for identifying potential partners and shaping our collaboration strategy.

This work started by:

1) **Identifying key project links** using the **SNS Vertical Engagement Tracker Tool** produced by the SNS ICE project, as well as examining public deliverables and project public activities, and via interactions within various WGs.
2) **Mapping** ongoing projects working on **Key Value Indicators (KVIs)** throughout publicly available SNS projects' deliverables, engagement in the various WGs, as well as one-on-one interactions with individual projects (e.g. online meetings, via EUCNC networking) Additional projects for engagement were identified via the 6G4Society workshop participation.
3) **Running surveys** in order to collect information from the ongoing SNS JU projects.

3.1.1 SNS SURVEYS TO CALL 1 AND 2 SNS JU PROJECTS

To create synergies within SNS JU and avoid duplication of efforts with other running activities, the consortium firstly engaged with the Societal Needs and Value Creation (SNVC) sub-Working Group as well as the Sustainability Task Force (TF). The exchanges highlighted information gaps that needed to be addressed by 6G4Society in order to be able to work

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towards its objectives and mandate. These gaps included: addressing social acceptance dimension in SNS JU, lack of a cross-cutting analysis of the KVIs landscape across all SNS JU projects.

A consistent part of 6G4Society' mandate is to contribute towards two main areas of work: Key Values and Key Values Indicators (KVI), and Social Acceptance (SA). With the need to better understand SNS JU projects' approaches to these thematic, in August 2024, 6G4Society launched a blanket Survey to all running projects (Call 1 & 2). The objectives of the Survey were to:

- Capture current narratives on the impact of 6G on society, environment, and economies being actively sought in your project.
- How projects understood the public's fears/concerns related to 5G.
- Understand approaches taken by projects, if any, to social acceptance.
- Identify where the SNS JU project and 6G4Society had opportunities for future engagements on activities related to KVIs and social acceptance.

The Survey was closed in September 2024, gathering a total of 22 eligible responses. The analysis of the results brought to light some key aspects that helped to inform the activity planning of 6G4Society. To exemplify, the survey provided further inputs into how SNS JU projects define their approach to social acceptance, their understanding of stakeholder interaction and their interaction with them (50% of the responders mentioned that they engage with final users and more than 50% stated that their interaction is based on a co-design and co-creation approach).The Survey has been functional in supporting 6G4Society in tailoring targeted and well-defined activities with selected SNS JU projects. To accommodate the new projects starting in 2025, the survey was revised with plans for a second launch in Q1 of 2025.

To create synergies within SNS JU and avoid duplication of efforts with other running activities, prior to defining the Survey 6G4Society engaged with the SNVC sub-Working Group as well as the Sustainability TF. The exchanges highlighted information gaps that needed to be addressed by 6G4Society in order for it to be able to work towards its objectives and mandate. These gaps included: addressing social acceptance dimension in SNS JU, a lack of a cross-cutting analysis of the KVIs landscape across all SNS JU projects.

3.1.2 TOWARDS A COMMON TECHNOLOGY ACCEPTANCE MODEL

Starting from the 22 replies received in the *Survey to SNS projects on KVIs and Acceptance*, we identified a subset of projects which addressed the concept of "acceptance" in their project work, at different levels of definition and detail.

Eight projects were contacted so far (further contacts will be made if needed) to engage them in interviews aimed at better understanding and describing their actual work on acceptance: VERGE, FIDAL, HEXA-X-II, ENVELOPE, PRIVATEER, TrialsNet, TARGET-X, SUSTAIN-6G.

Most of these projects are from Call 1, with the exception of SUSTAIN-6G (Call 3) that largely builds upon the work done within the HEXA-X-II project.

Interviews, tailored to each project, are currently being organised with a view to better understand how acceptance is meant and operationalised in each project. The final objective of these interviews is to scout 2-3 projects available to engage with the Social Acceptance

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Technology model. Based on lessons learnt of the project, the 6G4Society consortium will guide them in applying some aspects of the SAT framework.

3.2 CROSS-SNS JU COLLABORATIVE EFFORTS

As a first public engagement debut, very soon after the 6G4Society started, we worked in collaboration with the SNS JU office, but also with other players in the SNS JU ecosystem, to put together a special session proposal for the **EuCNC & 6G Summit 2024**. This session, which finally took place in June 2024, focused on presenting the main work of 6G4Society but also on discussing the main challenges and priorities to design a sustainable and socially accepted 6G. Engaging with experts on stage and various stakeholders attending this special session, has been a very concrete way to identify and connect with different stakeholders and projects actively engaged on sustainability matters. The outcomes of the session resulted in a white paper titled "Towards a Sustainable and Socially Accepted 6G for Society", launched in collaboration with SNS JU, as well as the FIDAL and BroadEU.Net projects. This short paper explores how 6G networks can address critical societal and environmental challenges by placing sustainability and social values at the core of future technological development. Key highlights from the white paper (available on the 6G4Society website) include:

- **Integrating sustainability and inclusivity:** Advocating for a proactive sustainability-by-design approach in 6G development, aligning technological advancements with urgent needs for environmental stewardship, social inclusion, and equity.
- **The role of KVIs:** Emphasising how KVIs can complement traditional Key Performance Indicators (KPIs) to guide 6G technology design, development, and adoption. This ensures that networks not only meet technical benchmarks but also contribute positively to society and the environment.
- **Social acceptance vs acceptability**: Explaining that both social acceptance and acceptability are critical for the successful implementation of technologies like 6G, as they address both current societal attitudes and future ethical implications, ensuring that innovations are both embraced and ethically sound.
- **The importance of public engagement:** Highlighting the critical importance of public engagement and inclusive decision-making in building the trust necessary for the successful deployment of 6G technologies.

3.2.1 LIAISONS AND COLLABORATIONS WITH SNS JU RIAS

Further liaisons and collaborations have been also established via the organisation of online and offline events of various nature that are summarised in the following.

Joint Workshop at Sustainable Places 2024 Conference (September 23-25, 2024, Luxembourg):

- **Collaborating with SNS projects:**
    - **6G-TWIN:** Focuses to enhance 6G performance and reliability by aiming to establish such an architecture by leveraging Network Digital Twins (NDT) for real-time control of complex network scenarios.

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- **BeGREEN:** Aims to integrate green energy solutions into next-generation mobile networks, by seeking to design evolving radio networks that accommodate increasing traffic and services without compromising power consumption.
- **COALESCE:** Seeks to decrease the distance in European societies to scientific understanding and address issues concerning public distrust and policy responses to scientific crises. It will do so by building on and adding to existing forms of excellence in science communication, public engagement with sciences and co-creation practices.
- **IN2CCAM:** Aims to accelerate the implementation of innovative (Cooperative, connected and automated mobility (CCAM) technologies and systems for passengers and goods, intends to develop, implement and demonstrate innovative services for connected and automated vehicles, infrastructures and users.
- **CENTRIC:** Proposes to design the future 6G by creating the user-centric AI Air Interface. It will leverage AI techniques to provide a top-down modular approach to wireless connectivity that focuses on users' communication needs and environmental limitations.
- **6Green:** Envisions 5G and 6G networks and vertical applications cutting their carbon footprint by a factor of 10 or more. The project will make the most of cloud native technologies and service-based architecture introduced in 5G, to evolve and develop network capabilities focused on the new generation of services. 6Green also intends to improve the flexibility, scalability and sustainability of the global ecosystem.

- **Purpose of Collaboration:** To convene experts from various projects focusing on sustainable 6G development, facilitating knowledge exchange and identifying synergies.
- **Activities Undertaken:** Organised a joint workshop during the Sustainable Places 2024 Conference, where each project presented their research findings and discussed collaborative opportunities on sustainability aspects.
- **Current Status:** We circulating an open letter on "*Towards Sustainable 6G: A Collaborative Call to Action for Addressing Environmental Challenges in (and thanks to) Future Mobile Networks"* summarising the key insights and action items identified during the session and to raise collectively voice the urgency of integrating environmental considerations into 6G development. We gathered endorsements from like-minded stakeholders and promoted the initiative through various channels. The letter has garnered significant support and is slated for publication in prominent industry journals.
- **Future Plans:** Organise webinars and panel discussions to further disseminate the letter's message and encourage actionable steps within the industry.

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Key Value Indicator (KVI) Workshop – 6G4Society & FIDAL Joint Event (October 25, 2024):

- **Collaborating with an SNS Project:** **FIDAL** focuses on developing advanced frameworks for evaluating 6G technologies, particularly in media and public protection and disaster relief sectors. FIDAL aims to establish Key Value Indicators (KVIs) that complement traditional performance metrics and help align 6G development with ethical and societal priorities.
- **Purpose of Collaboration:** To further establish the knowledge base, expertise, and needs towards defining a Key Value Indicators (KVIs) framework and methodologies that will guide the assessment of 6G technologies across SNS projects, ensuring that innovations align with societal expectations and sustainability goals.
- **Activities Undertaken:** The joint workshop primarily targeted SNS project partners, but also engaged industry leaders and researchers in interactive discussions about the hopes, fears and assumptions about KVIs and their role in shaping responsible 6G innovation. The workshop explored challenges, best practices, and strategies for implementing KVIs, emphasising the need for clear definitions and measurable impact.
- **Current Status:** A report has been created based on the workshop findings and widely circulated among the participants and stakeholders. The discussion identified key challenges, such as the difficulty in measuring KVIs within a project's lifecycle and the need for clearer connections between KVIs and traditional KPIs.
- **Future Plans:** Continue to develop the KVI framework, including common definitions, objectives, and priorities and promote its adoption within 6G standardisation efforts. The released report of the workshop aims to develop an action plan to address concerns, refine methodologies, and ensure practical implementation of KVIs across SNS projects.

6G4Society & Hexa-X-II Joint Webinar on Ensuring 6G Social Acceptance (November 6, 2024):

- **Collaborating with an SNS Project:** **Hexa-X-II** is a European flagship project focused on designing a sustainable, inclusive, and trustworthy 6G platform. The project aims to develop wireless technologies that address society's needs in the 2030s, with an emphasis on ethical, environmental, and societal considerations. Hexa-X-II seeks to define advanced use cases, services, and requirements that maximise value for society. A key objective is delivering a 6G platform blueprint that enhances connectivity while realising the vision of "networks beyond communications."
- **Purpose of Collaboration:** To explore societal concerns and ensure the social acceptance of 6G technologies by integrating ethical, environmental, and inclusivity principles from the outset. The collaboration aims to align 6G development with public expectations and values, fostering trust and long-term sustainability.
- **Activities Undertaken:**
    - Engaged with stakeholders from SNS JU, who emphasised the importance of **KVIs** in measuring and promoting sustainability and societal acceptance.

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- Presented findings from 6G4Society and Hexa-X-II on **integrating social acceptance, ethics, and sustainability into 6G development**.
- Offering insights into concerns such as privacy, security, and accessibility.
- Conducted **real-time participant polls** on key social acceptance priorities for 6G, reinforcing the need for transparency, sustainability, and inclusivity.

- **Current Status:** The webinar successfully brought together diverse perspectives and generated actionable insights on embedding social values into 6G development.
- **Future Plans:**
  - **Refine the Social Acceptance Model for 6G**, incorporating lessons from public surveys, expert discussions, and Hexa-X-II's ethical research.
  - **Expand collaboration with civil society and industry players** to foster multi-stakeholder dialogue and create actionable guidelines for socially responsible 6G deployment.

6G4Society & TrialsNet Joint Webinar on Objective and Subjective Approaches to Key Value Indicators (February 6, 2025):

- **Collaborating with an SNS Project:** **TrialsNet** is a European project dedicated to deploying large-scale trials to implement a diverse set of innovative 6G applications. These applications leverage advanced technologies such as cobots, the metaverse, massive twinning, and the Internet of Senses, focusing on three key urban ecosystem domains.
- **Purpose of Collaboration:** To collaboratively explore and refine methodologies and evaluation tools for both objective and subjective measurement of Key Values (KV) and Key Value Indicators (KVIs), focusing specifically on the challenge of non-technical KVIs. This collaboration aims to ensure that those working to assess the societal and sustainable impact of 6G technologies have the tools and skills to engage societal impact.
- **Activities Undertaken:** A Joint Workshop was organised that brought together experts from both projects, two additional SNS projects, as well as 4 external experts to share examples, and discuss methodological approaches towards defining and evaluating KVIs that focus on societal and sustainable impact.
- **Current Status:** We are in the process of developing a comprehensive report on the webinars' main outcomes.
- **Future Plans:** This collaboration aims to establish holistic evaluation practices that look beyond mapping KVIs to technical KPIs that will guide the responsible development and deployment of 6G technologies in ways that align with societal values and expectations.

3.2.2 LIAISONS AND COLLABORATION WITH SNS JU CSAS

To strengthen synergies and coordination especially in support of the various SNS JU projects, 6G4Society established connections with the other two ongoing CSAs, namely the SNS Operations (SNS OPS), and SNS Innovation and Communication Ecosystem (SNS ICE).

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While in the first 6 months ad hoc collaborations were ensured via the participation of Martel in SNS OPS as a partner, more formal consortium-to-consortium discussions have been organised from August 2024 on.

Key Contributions and Collaborative Efforts:

1. **A short input and recommendation paper** was put together and provided as input to the finalisation of the SNS JU Work Programme 2025. This document was sent to the SNS JU Office, SNS OPS and SNS ICE representatives, emphasising the critical need to align on overlapping and complementary activities to embed societal and environmental sustainability into 6G development. The paper highlighted that existing plans were predominantly centered on performance and energy efficiency, identifying key gaps in sustainability considerations and proposing consequent actionable steps.
2. **Reformulating the Vision Section of the SNS OPS Questionnaire:** Revised and contributed to the Vision section of the SNS Questionnaire, specifically targeting projects under **Call 3**. This effort aimed to refine questions to better capture aspects of sustainability and societal impact, ensuring that new projects align with these core values.
3. **Promotion of the SNS-ICE Vertical Engagement Tracker:** Advocated for the utilisation of the **Vertical Engagement Tracker**, an online tool made available via the 6G SNS web site to systematically map and monitor use cases across various vertical industry domains. This platform aids in aligning 6G research and innovation projects with industry needs, providing a structured framework for engagement and ensuring that technological developments are relevant and beneficial to diverse sectors.
4. **Verification of National Initiatives through SNS-ICE Member States Engagement:** Cross-checked identified national initiatives via the related SNS-ICE report on Member States engagement, as detailed in **Deliverable D2.1: Identification of European 6G R&I Stakeholders and Trends**. This process ensured a comprehensive understanding of ongoing efforts and facilitated the integration of diverse national activities into a cohesive mapping exercise.
5. **Integration of SNS stakeholder mapping produced by SNS OPS into the 6G4Society's stakeholder mapping:** The outcomes of the produced report, including recommendations on new organisations, new categories and sub-categories, as well as the removal of existing organisations, have been incorporated into our stakeholder mapping exercise.
6. **Thematic Meetings for Alignment and Collaboration:** Organised and participated in thematic meetings with SNS-OPS and SNS-ICE to synchronise efforts and foster collaboration on critical topics, including:
    - **JU Metrics and Methodologies:** Engaged in discussions to relate these metrics to the Technology Acceptance Model (TAM), Key Value Indicators (KVIs), and Key Sustainability Indicators (KSIs) for 6G, particularly concerning SNS-OPS Deliverables D1.1 and D1.2.
    - **Input to SNS Work Programme 2025:** Provided insights and recommendations to shape the Work Programme, advocating for the integration of sustainability and societal considerations.

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- **Alignment on SNS Roadmapping and Vision Activities:** Collaborated to ensure that long-term planning and vision-setting activities reflect a balanced emphasis on technological advancement and sustainability goals.

These concerted efforts underscore a commitment to steering 6G development towards a framework that not only excels in performance but also upholds environmental sustainability and societal acceptance as foundational pillars.

3.3 SYNERGIES THROUGH SNS JU TFS AND WGS

6G4Society aims to foster strong engagement in SNS JU Task Forces and Working Groups, ensuring that sustainability, inclusiveness, and social acceptance are at the forefront of 6G development. Additionally, all six partners in the consortium are members of the 6G-IA, enabling them to leverage ongoing research efforts and active participation in discussions and participation also in related 6G-IA working groups, ensuring coordination and structured handover of relevant findings.

6G4Society participated in and actively contributed to various SNS JU Task force activities:

- SNS JU/Sustainability Task Force.
- SNS JU/Communication Task Force.
- SNS JU/Vertical Engagement Task Force.

6G4Society is also involved in multiple SNS Working Groups to maximise impact:

SNS Project Working Groups (originating from SNS JU projects):

- SNS JU WG/6G Architecture WP.
- SNS JU WG/Test, Measurement, and KPIs Validation WG.

SNS Industry Working Groups (organised by 6G IA):

- SNS 6G-AI WG/Vision WG/Social and Value Creation Working Sub-Group.
- SNS 6G-AI WG/Vision WG/Member States Initiative Working Sub-Group.
- SNS 6G-AI WG/Pre-Standardisation Working Group.

Furthermore, 6G4Society is engaged in the activities of **NetWorld Europe WG** (SME WG managed by SNS OPS project).

3.3.1 SNS JU COMMUNICATION TASK FORCE

Past Activities (June 2024–February 2025):

- Regular participation in monthly meetings to provide updates on 6G4Society's progress.
- Support and help for promoting presence of SNS JU projects at MWC 2024 - in collaboration with SNS OPS and the SNS JU Office.
- Support and help for promotion of the EUCNC and 6G Summit 2024 event.

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- Coordinated communication and dissemination efforts, including newsletters, events, and publications, in collaboration with other SNS JU projects.

Ongoing and Future Activities (March–December 2025):

- Continuing active involvement in Task Force meetings to share developments and synchronise dissemination strategies.
- Exploring opportunities for joint activities and collaborative dissemination efforts to maximise outreach and impact.

3.3.2 SNS JU SUSTAINABILITY TASK FORCE

Past Activities (June 2024–February 2025):

- Participated in Task Force calls, contributing information and insights to support sustainability initiatives.
- Collaborated in organising the Sustainability Task Force session at the SNS Technical Board meeting in Castelldefels in October 2024.
- TF Chair Ali Razaki (Nokia) conducted interviews with 6G4Society in December 2024 to gather comprehensive sustainability data.
- Volunteered to analyse the data and co-author a paper based on findings from the sustainability questionnaire and interviews collected from SNS projects, with the goal of disseminating key insights to a broader audience.
- Collaborated to provide updates on 6G4Society activities for the Sustainability Task Force session at the SNS Technical Board meeting in Krisna in February 2025.

Ongoing and Future Activities (March–December 2025):

- Continuing active involvement at TF meetings to maximise the impact of sustainability efforts across the 6G community.
- Co-authoring the publication that synthesised data analysis from questionnaires and interviews collected from SNS projects with the goal of launching a white paper at EUCNC in June 2025.

3.3.3 SNS JU VERTICAL ENGAGEMENT TASK FORCE

Future Activities (March–December 2025):

- Engaging in consensus-building on KVIs to comprehend the unique requirements of various vertical sectors.
- Planning and conducting workshops, focus groups, and surveys to gather insights.
- Identifying and engaging user associations and communities recommended by stakeholders present in this group to further populate the citizen surveys and conduct other public engagement activities, to ensure diverse perspectives are considered.

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3.3.4 6G IA VISION WG/SOCIAL AND VALUE CREATION WORKING SUB-GROUP

Past Activities (June 2024–February 2025):

- Contributed to defining activities, roles, and responsibilities between the Social and Value Creation (SNVC) group and 6G4Society.
- Led thematic discussions on topics such as trust, gathering practical examples of KVIs in application.
- Organised a series of project presentations showcasing KVI development and evaluation, exploring variations and alternatives to the SNVC KVI methodology.
- Facilitated the exchange of best practices and challenges in applying KVIs across different contexts.
- Worked on increasing project engagement in Working Group meetings, ensuring broader participation and collaboration, with regular contributions from PSCE and CSL.

Ongoing and Future Activities (March–December 2025):

- Developing a White Paper that provides concrete examples on simplifying and applying the KVI methodology. Supporting in defining the content and goals of this paper in relation to 6G4Society activities.
- Refining best practices and disseminating them to guide projects in effectively implementing KVIs.
- Continuing to engage projects in Working Group meetings to present case studies and share real-world applications of the KVI methodology.
- Aligning the white paper with insights gathered from 6G4S workshops to ensure its relevance to project needs.
- Exploring opportunities to integrate outputs from small-group thematic activities led by 6G4S/WP3.
- Supporting the development of new methodologies or refinements to the existing KVI framework based on feedback and practical applications.
- Coordinating with stakeholders for the successful execution of the KVI workshop at EUCNC.
- Strengthening collaboration between SNVC, 6G4Society, and other relevant initiatives to foster innovation in value-driven network development.

3.3.5 6G-IA VISION WG/MEMBER STATE INITIATIVES IN 5G/6G SUB-GROUP (MSI SG)

Past Activities (June 2024–February 2025):

- Engaged with subgroup leadership (Carlos Anton, CTTC) to align efforts and foster synergies.

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Ongoing and Future Activities (March–December 2025):

- Integrating the outcomes to our Member States (MS) mapping and engaging exercise of the comprehensive report detailing European 6G research and innovation stakeholders and trends.
- Analysing and grouping the SNS-JU Sustainability Task Force Questionnaire in relation to societal issues raised by 6G4Society and contacting the partners of the relevant projects.
- Synergy building with like-minded SNS projects by investigating and where possible updating the document The voice of the European industry for the development and evolution of 5G. 5G, beyond 5G, and 6G Activities, Promoted by Member States, Release 2022.
- Information gathering at 3GPP, ETSI and CEN/CENELEC about standardisation activities, for example,ples at ETSI that has announced the establishment of a new Industry Specification Group (ISG) focused on Multiple Access Techniques (MAT) for 6G mobile systems. The group aims to build industry consensus on innovative multiple access techniques, based on 3GPP specifications. We aim to bring our factsheets and SAT model to the discussions.

3.3.6 6G-IA PRE-STANDARDISATION WG

Past Activities (June 2024–February 2025):

- Mapped standardisation contributions from SNS projects to inform the development of the 6G4Society standardisation plan.

Ongoing and Future Activities (March–December 2025):

- Dissemination of the survey as a part of the preparation of a structured 6G KVI/KSI ontology to establish a shared vocabulary among 6G-IA member projects to serve as a foundational tool for 6G-IA contributions to the 2026 standardisation phase.

3.3.7 SNS JU 6G ARCHITECTURE WG

Past Activities (June 2024–February 2025):

- Disseminated 6G4Society's objectives, ongoing and future activities and expected impacts, including the upcoming workshops and webinars.
- Contributed to the introductory section of the sustainability chapter in the 6G Architecture White Paper.
- Circulated the KVI and Social Acceptance' Survey by 6G4Society for SNS projects (Call 2 & 3 Projects) in order to identify how Phase 2 & Phase 3 projects within SNS Phase are approaching Key Values and KVIs and how are they applying them into their technology design and development, and understanding projects' approaches (where applicable) to social acceptance of 6G, including the possible implementation of specific technology acceptance models or frameworks.

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Ongoing and Future Activities (March–December 2025):

- Dissemination of the standardisation survey contributing to the preparation of a structured 6G KVI/KSI ontology.
- Peer-reviewing and co-authoring the entire sustainability chapter in the 6G Architecture White Paper.

3.3.8 SNS JU WG/TEST, MEASUREMENT AND KPI VALIDATION WG (SUBWG ON KVI)

Ongoing and Future Activities (February–December 2025):

- Contributing to the White Paper by integrating the ontology work of 6G4Society into KVI definitions, ensuring alignment between conceptual frameworks and practical applications.
- Supporting the further development of the ontology by leveraging data gathered from various projects, refining its structure and applicability.
- Act as a liaison between TMV and SNVC sub-Working Groups to facilitate collaboration and ensure coherence in methodology and objectives.
- Coordinated efforts for the KVI workshop submission to EUCNC, aligning it with broader project goals and strategic priorities.

3.3.9 COLLABORATION IN NETWORLD EUROPE WG (SME WG)

Past Activities (June 2024–February 2025):

- Presented 6G4Society's activities and objectives to the working group, highlighting the project's focus on integrating societal values into 6G development.
- Promoted the 6G4Society Citizen Survey to gather public insights on 6G technology, aiming to inform development with user-centric perspectives.

Ongoing and Future Activities (March–December 2025):

- Volunteered to contribute to the upcoming SME position paper for 2025, specifically authoring Chapter 2 titled "Towards a Sustainable Digital World," which focuses on vision, policies, and the role of SMEs in meeting ecosystem needs.

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4 LIAISONS ACTIVITIES BEYOND THE SNS JU ECOSYSTEM

Collaboration and knowledge exchange beyond the SNS JU context are essential for making sure the planned work and outcomes of the 6G4Society project can effectively contribute to align efforts that aim at the development of a sustainable 6G. This section focuses on the project's active engagement in liaison activities designed to foster strategic alignment with relevant research, innovation, policy, and regulatory initiatives across Europe.

Our liaison activities have been diverse, encompassing participation in key events and working groups, engaging with external Advisory Experts, exchanging and promoting relevant efforts, and delivering structured input via the SNS JU Office to the State Representative Group (SGR) composed of representatives of each Member State and Associated Country.

By actively engaging stakeholders outside the SNS JU ecosystem and initiatives/representatives of various Member States (MS), 6G4Society seeks to contribute to a shared understanding of the challenges and priorities surrounding the development of a 6G that by design is sustainable at a pan-European level.

4.1 ESTABLISHED EXTERNAL LIAISONS OVERVIEW

With the expression “external liaison”, within the context of this document, we refer to a liaison established with initiatives and/or stakeholders external to the SNS JU ecosystem. Some of these have a more European-focused span of influence and action, while others have a more global scope/range of motion. In the following, we summarise the main external liaisons we established during the first 14 months of the project.

The SHIFT project

The liaison has been established by inviting Hugues Ferreboeuf as member of the 6G4Society External Advisory Board.

The Shift Project (https://theshiftproject.org) is a French think tank that advocates for a carbon-neutral economy. They focus on conducting research and proposing solutions to accelerate the transition towards a sustainable society. Their work covers various sectors, including energy, transportation, finance, and digital technology. The Shift Project aims to raise awareness about the urgency of climate action and promote policies and initiatives that support decarbonisation. They engage with businesses, policymakers, and the public to foster collaboration and drive change and their work provides valuable insights for decision-makers and stakeholders involved in the transition to a sustainable future. Among others, one of their key areas of focus is **digital sufficiency**, advocating for responsible and sustainable use of digital technologies.

In this respect, by collaborating, SHIFT and 6G4Society can amplify their impact and contribute to a more cohesive approach to sustainable development of 6G. For instance, SHIFT's research and work on digital sufficiency (several documents were shared by Hugues Ferreboeuuf with our consortium) have informed some of the 6G4Society's activities. Conversely, 6G4Society's insights on the potential of 6G to enable sustainable solutions can support SHIFT's broader advocacy for a carbon-neutral economy.

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In both France and globally, the digital sector accounted for approximately 10% of total electricity consumption in 2022 (The Shift Project, 2021, 2023). In a context of intense electrification of uses (mobility, building, industry, etc.), it is clear that digital technologies are also at the heart of planning issues for the transformation of our systems and the prioritisation of access to now-strained resources, including electricity.

The work conducted within The Shift Project last report "Energy & Climate: Lean networks for resilient connected uses10" has highlighted the significant impact of collective choices on the dimensioning of mobile networks regarding the development of new services and methods of access (geographical, temporal) to these services. One of its recommendations is to create a **space for consultation** (citizens' and companies' conventions, expert interviews, institutional assignments and/or other modalities).[1]

ACM GoodIT

Prof Johann Marquez-Barja is a member of the 6G4Society External Advisory Board and as an engaged representative of IMEC (Belgium), he is directly involved in the ACM GoodIT initiative, which is an ACM small yearly conference (typically about 100-120 people) focused on promoting ethical and responsible computing practices. It aims to raise awareness about the societal impact of technology and encourage the development of computing solutions that benefit humanity. ACM GoodIT focuses on several areas:

- **Ethical Considerations:** Examining the ethical implications of computing technologies and developing guidelines for responsible design and deployment.
- **Social Impact:** Analysing the impact of technology on society and promoting the use of computing for social good.
- **Sustainability:** Encouraging the development of sustainable computing solutions that minimise environmental impact.
- **Education and Awareness:** Raising awareness about ethical and responsible computing practices among students, professionals, and the public.

Both ACM GoodIT and 6G4Society recognise that technological advancements, particularly in the realm of 6G, must be guided by ethical considerations and a commitment to social good. 6G4Society can benefit from ACM GoodIT's resources and expertise in ethical frameworks and responsible innovation. In turn, 6G4Society can provide ACM GoodIT with valuable insights into the specific ethical considerations related to 6G, contributing to the development of more targeted guidelines and recommendations.

For the ACM GoodIT 2025 edition, which will be held between the 3rd and 5th of September 2025 in Antwerp (organised by IMEC), the 6G4Society Coordinator has been invited to provide a keynote in which, among others, 6G4Society will be presented.

[1] *The Shift Project - Lean ICT: towards digital sobriety (2019) 19 The Shift Project - Energy & Climate: Lean networks for resilient connected uses (2024). The Shift Project answer to public consultation on the European Commission White Paper "How to master Europe's digital infrastructure needs?"*

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6G Flagship

Dr Marja Matinmikko-Blue Research Director of Infotech Oulu and Director of the Sustainability and Regulation of 6G Flagship at the University of Oulu is a member of the 6G4Society External Advisory Board.

The 6G Flagship is a pioneering research program based in Finland that conducts cutting-edge research across a wide range of 6G technologies, exploring, among others, the societal implications of 6G such as its impact on healthcare, education, and industry. Sustainability is also a key focus area for the 6G Flagship initiative which incorporates sustainability in their research and innovation efforts in various ways:

- **Energy Efficiency:** They are exploring technologies and architectures that can significantly reduce the energy consumption of 6G networks. This includes research on energy-efficient hardware, software, and network management techniques.
- **Resource Optimisation:** They are investigating ways to optimise the use of resources, such as spectrum and infrastructure, to minimise the environmental footprint of 6G deployments.
- **Circular Economy:** They are promoting the principles of the circular economy in the design and manufacturing of 6G equipment, encouraging the use of recycled materials and the development of devices with longer lifespans.
- **Environmental Monitoring:** They are exploring the potential of 6G technology to enable environmental monitoring and sustainable resource management, such as smart agriculture and smart grids.

The 6G Flagship excels in cutting-edge technological research and ecosystem building, fostering collaboration between academia, industry, and government agencies. 6G4Society brings strong expertise in societal aspects of 6G, including sustainability, ethical considerations, and social acceptance.

one6G - participation to the one6G Summit 2024

one6G is a non-profit association focused on shaping the future of 6G technology in Europe. They aim to create a collaborative platform for stakeholders across the 6G ecosystem, including industry, academia, research institutions, and policymakers. one6G's activities include organising events and workshops, publishing reports and white papers, and participating in standardisation efforts. They aim to serve as a central hub for information and collaboration, facilitating the exchange of ideas and best practices within the European 6G community.

In September 2024, the 6G4Society project was invited to take part in discussions taking place at the one6G Summit 2024 on *"Global 6G Development" addressing the crucial question: how can we harness 6G for society and the environment?*

Both the one6G initiative and the 6G4Society project recognise the transformative potential of 6G technology and its impact on various aspects of society. They both emphasise the importance of human-centricity, sustainability, and ethical considerations in 6G development. By collaborating, they can reinforce these shared values and promote a responsible and inclusive approach to 6G.

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While exchange of knowledge and relevant information is ensured by Martel that is a member of the one6G association, discussions are ongoing about the possible organisation of a session dedicated to societal acceptance of 6G within the context of the next edition of the one6G Summit, planned for Q3 2025.

ETSI - European Telecommunications Standards Institute

The European Telecommunications Standards Institute (ETSI) plays a crucial role in shaping the future of mobile communications by developing globally recognised standards for next-generation networks. As an influential player in the 6G landscape, ETSI fosters collaboration among industry leaders, research institutions, and policymakers to define the technological and regulatory framework for future wireless communications. Through its working groups and pre-standardisation efforts, ETSI provides a platform for bringing together diverse perspectives and ensuring that 6G development aligns with the needs of society and industry.

The 6G4Society project is actively pursuing ETSI-driven endorsement to ensure that societal and sustainability perspectives are proactively integrated into emerging 6G standards, as part of a broader strategy to bridge the gap between technical standardisation and non-technical considerations. The project has made significant strides in pre-standardisation discussions, particularly through the development of the KVI/KSI Ontology, a structured framework that captures Key Value Indicators (KVIs) and Key Sustainability Indicators (KSIs) relevant to 6G standardisation. This ontology serves as a reference to embed social and environmental concerns into the technical standardisation process, providing the structure and operational relationships between them.

As part of our ongoing efforts to support the inclusion of KVIs and KSIs in standardisation efforts within 6G development, 6G4Society is currently pursuing the inclusion of the KVI/KSI ontology within the Smart Applications REFerence (SAREF) ontology framework. SAREF, developed under ETSI, provides a widely recognised semantic model for interoperability across IoT and emerging digital infrastructures. By aligning our KVI/KSI ontology with SAREF, we aim to establish a structured, machine-readable framework that facilitates the integration of societal acceptance, sustainability, and ethical considerations into future 6G standardisation efforts. This initiative is currently in progress, with ongoing discussions within ETSI and the smartM2M TC tasked with the maintenance of the SAREF ontology suite, and key stakeholders to promote adoption within Y2. The inclusion of our ontology in SAREF would not only strengthen cross-domain applicability but also provide a practical mechanism for embedding social and environmental sustainability principles into 6G standardisation frameworks, ensuring a responsible and inclusive technological evolution.

NGMN - Next Generation Mobile Networks Alliance

We are in discussions to organise a webinar in Q2 2025, framing the discussion to cover the topic of “Green Next-Generation Networks: Sustainability Challenges and Initiatives in Mobile Networks.” Their global alliance of nearly 70 companies and organisations—including operators, vendors, and academia, drives global alignment and convergence of technology standards and industry initiatives to avoid fragmentation and support industry scalability. From our side we would like to introduce the notion of KVIs. The main goal of this workshop can be designed around two sets of activities. These explore: 1) how 5G/6G projects are working with KVIs to address positive impacts of 6G innovation on society including their hopes and fears

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in this process, and 2) challenges and best practices in defining and implementing KVIs in ways that show impact.

There are great hopes that KVIs provide a new route to align innovation with societal expectations in ways that can support: building public acceptance of 6G, creating more responsible and ethical innovation, and putting people and the environment as a priority. By doing this, it is hoped KVIs can support technology developers to focus on the relevant aspects beyond technological performance in their work.

4.2 ALIGNMENT WITH MEMBER STATES INITIATIVES

It is vital at this early stage of development that all Member States are aware of each other's 6G developments to ensure convergence and integration at a pan-European level, not to duplicate efforts and align on the societal and sustainability aspects that have to go hand in hand with technical development. In Lithuania for example, the first 6G pilot tests will start in 2026. In Slovakia no roadmap has been defined yet. The ambition is to make sure that technology developments are driven by societal, environmental and economic needs - and not the other way around. This requires a market/society-pull approach rather than a technology push one. To do so, engaging with citizens and end users, private and public institutions, as well as policy makers and industrial players across Europe is essential. A clear focus on KVIs[2] is therefore inseparable from successful 6G implementation across Europe.

Therefore, this section outlines our past and current activities and forward-looking plans for engaging with Member States within the evolving 6G ecosystem. It captures the progress made so far for mapping and fostering synergies among national initiatives, particularly in the realms of societal impact and sustainability in liaisons with initiatives at Member States (MS) level.

Smart Networks and Services Joint Undertaking (SNS JU) stressed the importance of the involvement of Member States from the Kick-off Meeting onwards (January 2024). The SNS JU recommended to get through on the national initiatives also to have a broader impact and collaborate with those Member States having societal aspects and sustainability on the agenda. Therefore, our approach focuses on pinpointing the most active Member States through multiple channels: engaging National Contact Points, collaborating with the 6G-IA Vision Sub Working Group Member State Initiatives in 5G/6G sub-group (MSI SG), and working with the SNS JU Governing Body States Representative Group (SRG), all of which are central to our data collection process.

4.2.1 6G4Society alignment with MS until now (14 months)

In order to create a comprehensive mapping on existing initiatives and projects on Member States level, our approach began with a continuous desk search designed to identify and align with relevant European and international initiatives. We are reviewing materials, including the 2022 report on 5G/B5G/6G Member States initiatives, released in March 2023. This report highlights the various activities promoted by Member States, Associated Countries and

[2] *In the 6G-IA White Paper "What societal values will 6G address? – Societal Key Values and Key Value Indicators analysed through 6G use cases" it is stressed that KVIs are used for monitoring and validating the impact on key societal values, and vice versa, for studying how societal Key Values can be enabled by steering technology developments in certain directions.*

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Candidate Countries which are relevant for the deployment of 5G communications networks and their evolution “Beyond 5G” towards “6G” networks. In close coordination with the SNS ICE project, we reviewed the D2.1 Identification of European 6G R&I stakeholders and trends. This report gives an overview of the different activities that SNS ICE has done in 2023 to foster collaboration and exchange of information between different 6G initiatives in Europe and recommendations of possible collaboration actions. We are cross-checking the list of national initiatives, which focuses on mapping European 6G research and innovation stakeholders. To support this work, we maintain and continually update a comprehensive stakeholder database, integrating input from projects in SNS ecosystem, representatives engaged via National Contact Points, the 6G4S Advisory Board members, participants of 6G IA WG Vision/Member State Initiatives SWG, as well as SRG WG.

We have already engaged key stakeholders, including Carles Anton Haro (CTTC, Chair of the 6G-AI Vision SWG MS Initiatives), in discussions regarding an updated report anticipated for 2025. This collaborative effort reinforces our commitment to streamlining initiatives and avoiding duplication.

Additionally, we have disseminated our activities by sending materials detailing our main objectives, conducted activities and expected short-and long-term impacts to the SRG meetings (held in June 2024 and in September 2024) in order to seek like-minded initiatives on societal aspects and sustainability. The SRG is an adequate platform for our outreach activities as it is composed of representatives from each Member State and Associated Country, and it is mandated to advise on research and innovation under Horizon Europe and deployment initiatives under CEF2 Digital and other EU programmes. We plan to approach this Working Group to gather insights via targeted questionnaires and surveys, and to organise dedicated webinars (see section 4.4) to promote more open and effective outreach.

4.2.2 Approach of Member States initiative mapping and engagement liaison and collaboration activities

The prospective design and development of 6G offers Europe a pivotal opportunity to align technological innovation with societal values and sustainability goals. Spearheaded by 6G4Society, this initiative emphasises a human-centric approach with a focus on societal key values such as inclusion, sustainability, and trustworthiness, leveraging Key Value Indicators (KVIs) to assess and guide the design of human-centric impact and ensure societal impact of 6G technologies and solutions. This document outlines the methodology and preparation process for the Member States (MS) Sub-Working Group (SWG) meeting, a critical step in fostering dialogue and harmonisation among MS representatives. By understanding national priorities, addressing common challenges, and exploring synergies, this initiative aims to lay a robust foundation for the European 6G evolution. The framework draws on insights from the SNS JU 6G4Society project, from the 6G-IA White Paper,[3] and lessons learned during the 4G

[3] *This white paper focuses on the ongoing global efforts to develop and standardise 6G networks, aiming for a launch around 2030. It highlights the importance of creating a unified 6G vision, driven by key stakeholders worldwide towards a single global consensus. The European perspective, represented by the 6G Smart Networks and Services Industry Association (6G-IA) is emphasised, showcasing Europe's proactive role in 6G R&D, standardisation, and addressing societal, environmental, and economic/business challenges.*
https://6g-ia.eu/wp-content/uploads/2024/11/european-vision-for-the-6g-network-ecosystem.pdf

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to 5G evolution, ensuring a comprehensive approach to the next planned mobile networks transition towards 6G (see deliverable D1.1 for more details).

The work on values focuses especially on the current effort of SNS (Smart Networks and Services) projects in incorporating key values into 6G technological development, with a view to elaborate the background necessary to build a framework for Key Sustainability Indicators (KSIs). Recommendations are made for further clarifying the goals and process by which values are translated into action for 6G, acknowledging the different ways value can be understood and become part of technology, and assessing the current activities within SNS projects working with KVIs. The section then presents the steps required in order to build a framework of KSIs, which addresses environmental, economic, and societal sustainability in an integrated manner.

Hexa-X, a flagship for 6G vision and intelligent fabric of technology enablers connecting human, physical, and digital worlds, recognises the necessity to expand the fundamental network design paradigm from mainly performance-oriented to both performance and value-oriented. Here value entails intangible yet important human and societal needs such as sustainability, trust, and inclusion. This will lead to a new class of evaluation criterion, i.e., KVIs that must be understood, developed, and adopted in the network design towards 6G. This approach, which constitutes an innovation in itself, aims at ensuring a responsible innovation, namely through achieving net-zero emissions, respecting human rights, and avoiding undesired externalities.

KVIs that focus on the activities that inform conception and design can both mitigate biases that could emerge and become an opportunity to be more transparent about driving the narrative of how a given innovation brings benefits. Understanding how values can be proactively embedded from conception to use can open up the variety of KVIs being created, beyond project outputs.

Societal impact

The integration of 6G in Europe is the first hyper connector technology that can be curated by a broad coalition of technology, legislation, industry and citizens. As we know, the internet 'happened' as did the web. Yet IoT, Machine Learning and AI all grew from predictive maintenance on the factory floor spilling gradually over into the world. So did connectivity grow alongside. For citizens the progress up to 4G was very tangible and positive in terms of visuals, movies, real-time interaction. The reasons for 5G and 6G are less compelling from the point of view of citizens. As we learned from the Citizen Survey there are still a lot of open questions as to where the real value for everyday life and living may lie. From an industrial point of view, it is clear that 6G will speed up native AI applications and create a hyper connectivity that will bring its own new use cases that can now not be conceived fully. From a political point of view there is a regional race going on that Europe cannot afford to miss out on. The notion of society and societal benefit must then be seen beyond the notion of sustainability as energy efficiency or vertical economic benefits, as answering the question what kind of hyper connectivity do we want for society.

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6G4Society brings three concepts and presents to the MS representatives in the SWG:

Key Values and Sustainability Indicators

Key Value Indicators (KVIs) that focus on the activities that inform conception and design can both mitigate biases that could emerge and become an opportunity to be more transparent about driving the narrative of how a given innovation brings benefits. We explore how KVIs are already being used in SNS JU context to bring sustainability into view and outline the next steps to enhance this process from a social, environmental and economic perspective. Finally, from this we establish the steps and criteria to build a framework of Key Sustainability Indicators (KSIs).

Values

When principles are leveraged without a rich understanding of the values they encompass or how they matter to and create an impact in the world around 6G, priorities are often decided based on business interests, cultural biases, or technological capabilities. In the context of the 6G4Society project, this specific approach was shaped by discussions instigated by the European Commission regarding the challenges faced by 5G implementation. These reflections on why 5G failed to meet certain expectations led us to recognise the potential value of identifying and analysing controversies as a crucial step in developing our Social Acceptance of Technology framework.

Social Acceptance of Technology Model (SAT)

We present a comprehensive model to explore and evaluate technology acceptance within Research and Development (R&D) and Research and Innovation (R&I) contexts: the Social Acceptance of Technology (SAT) framework, a multi-level approach to acceptance and acceptability, able to comprehensively assess the complex dynamics proper of the 6G context, highlighting the importance of addressing controversies as a foundational step in assessing social acceptance. Controversies emerge because the passage from a more abstract definition of a value, and its concretisation into specific objectives, implies the possibility of different interpretations and of different specific applications, which do not transfer across time/place.

4.3 SWG MEETING PREPARATION

One of the goals of the Member State Initiatives Sub Working Group (SWG) is to verify which important aspects of 6G research are covered and to what extent (and how) within the research programmes and initiatives of the Member States (MS). In this SWG meeting we address societal acceptance and citizen awareness as addressed in the 6G4Society project.

Session Objectives:

- Build awareness among MS representatives on the work led by 6G4Society (6G4S).
- Complement the mapping of 6G4S on the current national initiatives on 6G4S.
- Explore synergies and ways of working together between 6G4S and interested MS.

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- Build a stronger understanding of how to communicate and interact with different expert audiences.

During the meeting:

- Introduction of 6G4S Partners and short introduction to the project.
- Presentation of results from the short questionnaire and webinars.
- Discussion sessions (Open discussion):
  - We present a comprehensive model to explore and evaluate technology acceptance within R&D and R&I contexts: the SAT framework, a multi-level approach to acceptance and acceptability, able to comprehensively assess the complex dynamics proper of the 6G context, highlighting the importance of addressing controversies as a foundational step in assessing social acceptance.
  - Next steps in streamlining educational material.

Before the meeting on the 3rd of June, we will send a short questionnaire to the MS. We will organise three webinars with experts, MS representatives and activities stimulated by national and regional ministries, public agencies, regulatory bodies, cities, etc. We have contacted the national NCP on 6G projects relevant to the 6G4Society mission and will report back on this.

These activities will form the main input for the SWG meeting.

Preparation before the meeting:

2-3 weeks prior to the meeting, launch a short questionnaire to the SWG Members collecting information on:

- Ongoing or planned national initiatives on 6G with brief description of goals and current status.
- How do MSs address the societal aspects and impact of 6G.
- What are national level initiatives to educate the public about 6G?

Every month from March onwards (depending on the time of the SWG/SRG Meeting) a webinar will be advertised to the SWG and the broader 6G community.

Webinar 1

In this webinar we focus on the Nordic countries, as a group that are more advanced than others in 6G development. What constellation of synergies, context, and technological leadership helped to create their advanced position? How do KVI's and Sustainability play a role? ETSI board member and SNS-JU Vice Chair Colin Wilcock stated that Key Value Indicators (KVI) are “changing the whole premise of what we think a good mobile network will be, and KVIs could help telecoms’ commercial decision-makers steer a path”, in *Key Value Indicators – Making Good Business*, 6G World.

How have stakeholders been approached? Are citizens involved? How can KVIs be used to support the decision-making and steering at this level? How has sustainability been successfully folded into industry planning?

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Speakers from Norway, Finland[4], and Sweden.

The Nordic countries are among the most advanced in development at the moment. Both Finland and Sweden have signed an agreement with the US to explore possibilities to create a joint ecosystem for R&D in 6G technology and applications. This partnership "reportedly involves collaboration between the private sectors, which is expected to be crucial for the development of a sustainable 6G network."[5] KVIs offer “one way for innovators to stimulate and enable societal KVs while building new solutions, representing a strategic shift towards “Big Democracy” rather than “Big Tech” KVIs differ from Key Performance Indicators (KPIs) in that they provide deeper insight into human-related factors and can require conversations and creativity to emerge.”[6] KVIs are “gaining traction as a valuable part of the innovation toolkit, and this framework can provide key stakeholders with relevant concepts and components to work with.”[7]

Webinar 2

This webinar looks at some of the most controversial areas. The success of 5G/6G and other emerging technologies, such as 6G, will depend on our ability to navigate the tensions and trade-offs between innovation and precaution, efficiency and democracy, national priorities and local autonomy.

Speakers from France: Italy, and Belgium

This webinar focuses on the 6G Social Acceptance of Technology Framework specifically designed in the 6G4Society project as a way to navigate these issues. We propose a comprehensive model to explore and evaluate technology acceptance within Research and Development (R&D) and Research and Innovation (R&I) contexts: the Social Acceptance of Technology (SAT) framework, a multi-level approach to acceptance and acceptability able to comprehensively assess the complex dynamics proper of the 6G context. By learning from the experiences of France, Switzerland, Italy, and other countries grappling with (local but vocal) challenges surrounding new technologies, we can chart a path forward that harnesses the transformative potential of these technologies while ensuring that they serve the needs and aspirations of all members of society.[8]

Webinar 3

In this webinar we focus on a particular vertical group, namely farmers, because ‘rural’ is an important domain in 6G and we might have to consider tailored communication to specific groups. How are new technologies including AI, 5G, 6G communicated, explained and

[4] *6G Bridge – Business Finland-funded national program focusing on 6G Advanced 6G Finland – Active coalition of Finnish 6G R&D organisations incl. Nokia Bell Labs 6G Flagship – Research Council of Finland-funded flagship research program for 6G*

[5] *https://www.androidheadlines.com/2024/08/us-sweden-partner-6g-development.html*

[6] *6G Infrastructure Association. Vision and Societal Challenges Working Group. Societal Needs and Value Creation Sub-Group. What societal values will 6G address?. Societal Key Values and Key Value Indicators analysed through 6G use cases. May 2022. Date: 2022-05-31 Version: 1.0. DOI 10.5281/zenodo.6557534*
URL: https://doi.org/10.5281/zenodo.6557534

[7] *Key value indicators: A framework for values-driven next-generation ICT solutions corresponding author M. Matinmikko-Blue. Contents lists available at ScienceDirect. https://doi.org/10.1016/j.te*

[8] *See D1.1*

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introduced to a niche audience and specific sectors? How are they being resisted? Are social scientists involved in the technical programmes and building of use cases? Who are the stakeholders in the rural projects that have been rolled out, envisioned? What exactly are the stakeholders being asked to accept and why? What are the social and practical implications of this?

Speakers from Greece, Spain, and Turkey.

Greece: Multi-purpose physical-cyber agri-forest drones ecosystem for governance and environmental observation[9].

Spain: Real-time monitoring for increasing production of tomato in greenhouses in the Balearic Islands (Spain) using IoT sensors[10].

Turkey: Smart olive tree farming[11]

These use cases/pilots are mentioned as relevant to 6G networks in the AIOTI White Paper "The role of 6G in agriculture", from May 2024. According to the authors:

"Agriculture is one of the key contributors to European GDP. Almost 40% of the EU budget is spent on agriculture to sustain healthy food, meat and fish production in a sustainable way. In the current landscape of agriculture and aquaculture for food production, digital technologies have emerged as a transformative force leveraging cutting-edge technologies to enhance productivity, sustainability, and decision-making processes. Digital farming and precision agriculture are key trends which will leverage the evolution of IoT technologies and the evolution of connectivity services from 5G to 6G that will collect more high fidelity data to monitor soils, crops, animal wellness and trigger automation in this sector."

These are highly relevant handprints in the sense that they go beyond reducing footprint but actually can contribute to better quality of food production.

[9] *https://spade-horizon.eu/*
[10] *PLOUTOS: https://ploutos-h2020.eu/*
[11] *COMMECT: https://www.horizoneurope-commect.eu/living-labs*

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5 FUTURE PLANNED ACTIVITIES

Throughout the first 12 months of the 6G4Society project, significant progress has been made in fostering collaborations, establishing key liaisons, and integrating societal and sustainability considerations into the broader 6G ecosystem. The project successfully leveraged our consortium's joint expertise to build meaningful connections with relevant stakeholders across SNS JU projects, working groups, and external initiatives.

Lessons learned:

1) **Strategic engagement is essential:** Early and structured engagement with SNS JU projects, task forces, and working groups proved vital in aligning efforts and avoiding duplication. The participation in collaborative initiatives, such as SNS OPS and SNS ICE, provided a solid foundation for knowledge exchange and policy input.
2) **Stakeholder involvement drives our impact:** Engaging with a diverse range of stakeholders—including policymakers, researchers, industry leaders, and citizens—has reinforced the need for a human-centric approach to 6G development. The emphasis on KVIs and sustainability considerations, including KSIs, gained traction as essential components of future networks.
3) **Public perception matters:** Surveys and expert consultations highlighted the importance of social acceptance in technology adoption. Addressing public concerns, ensuring transparency, and integrating sustainability and ethics from the outset are crucial for fostering trust in 6G technologies.
4) **Collaboration beyond SNS JU strengthens reach and influence:** Communication, collaboration, and partnerships with external organisations, such as ETSI, the 6G Flagship, and national 6G initiatives, have been instrumental in expanding the project's reach and aligning with broader European and global developments.

Future planned activities:

Building on these lessons, Section 5 outlines the forward-looking strategy of 6G4Society. The upcoming activities (detailed in Sections 5.1–5.5 below) will focus on:

1) Deepening collaborations leading to tangible results, such as publications, webinars, conferences, surveys within the SNS JU ecosystem through continued engagement with working groups and task forces.
2) Organising high-impact webinars, workshops, and knowledge-sharing sessions to advance discussions on KVIs, sustainability, and social acceptance.
3) Strengthening liaisons with Member States to align national 6G initiatives with European strategic objectives.
4) Further developing methodologies for assessing KVIs and KSIs and integrating them into European and global 6G standardisation efforts.
5) Expanding outreach and advocacy efforts to promote a responsible and sustainable 6G transition.

As 6G research progresses, these planned activities will ensure that the societal dimensions of technology remain a core focus, bridging the gap between technical advancements and real-world impact.

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5.1 WEBINARS, WORKSHOPS, AND COLLABORATIVE INITIATIVES

To foster dialogue and knowledge exchange, 6G4Society is planning to organise and participate in further several high-impact events aimed at advancing sustainability in 6G networks.

In **Q2 2025** we are organising a collaborative effort with Next Generation Mobile Networks Alliance (NGMN) through co-holding a webinar in framing the discussion to cover the topic of **"Green Next-Generation Networks: Sustainability Challenges and Initiatives in Mobile Networks". The focus is on** addressing sustainability challenges in mobile networks. This initiative would bring together experts to discuss sustainable solutions for the future of 6G.

In addition, 6G4Society is co-organising a **Pre-standardisation & Standardisation for Sustainable 6G Webinar in Q2 2025** in collaboration with **ETSI**, where key stakeholders will explore the role of standardisation in achieving sustainability objectives within the 6G ecosystem.

Furthering its commitment to sustainability advocacy, 6G4Society is actively contributing to **Special Sessions and Workshops on Sustainability at EUCNC & 6G Summit 2025**. These workshops, organised jointly with other **SNS JU projects** (SUSTAIN-6G,Hexa-X-II, CENTRIC, TrialsNet, Fidal, 6G-SAFE), will focus on operational sustainability, social sustainability, and the practical application of KVIs in project implementation throughout the following sessions:

- **Operational Sustainability Workshop on "Technology Enablers for Sustainable 6G Design**" organised by Gigasys Solutions in collaboration with 17 SNS projects, the SNS Sustainability Task Force, and the 6G-IA Vision Working Group, will cover key topics such as AI-driven energy efficiency, secure and sustainable network design, NTN and IoT for sustainability, and the role of observability and metering in green network operations. Discussions will also focus on the latest insights from SNS JU-funded projects, including sustainability targets, trade-offs, and challenges. The event will feature expert presentations, case studies, and a panel discussion to align research efforts, define sustainability metrics, and drive industry-wide adoption of green 6G solutions.
- **Social Sustainability & KVI Workshop on "Societal Sustainability Driven by Values: Transforming 6G Through Key Value Indicators,**" aims to explore how KVIs can bridge the gap between technological innovation and societal impact in 6G development. Organised by experts from 6G4Society, SUSTAIN-6G, and other SNS JU projects, the workshop will define societal sustainability in the 6G context, showcase real-world applications of KVIs, and discuss methodologies for measuring societal impact. The session will feature two interactive panels focusing on conceptualising societal sustainability KVIs and their practical implementation across different sectors. Key topics include aligning social values with technical performance, integrating societal impact into 6G research, and standardising KVIs for future networks. Through expert presentations, case studies, and discussions, the workshop will identify gaps, propose strategic solutions, and drive 6G development toward measurable societal benefits.
- **Special Session on "Social Acceptance as a Catalyst for Sustainable 6G: Bridging Technology, Society, and Policy"** aiming to bring together experts from SNS JU projects, industry leaders, policymakers, and researchers to discuss how

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social acceptance influences the design, adoption, and sustainability of 6G networks. Key topics include the integration of trust, transparency, and stakeholder engagement into technology development, lessons learned from 5G deployment, and the role of social and environmental KVIs in fostering public trust. The session features a keynote speech, expert presentations, a panel discussion, and a Q&A segment, aiming to establish a unified approach to embedding social values in 6G innovation.

5.2 COORDINATION AND ALIGNMENT WITH SNS WGS

A key challenge within the SNS ecosystem is ensuring that different working groups (WGs) and sub-working groups (Sub-WGs) coordinate effectively on overlapping themes. One of the primary concerns has been the **lack of synchronisation** between the **SNVC and TMV WGs**, particularly in areas related to **KVIs and sustainability**. Improved transparency and collaboration between these groups would enhance efficiency and prevent redundancy. To address this, 6G4Society is advocating for a more structured approach to inter-group coordination (see **Section 2.4** for details).

Another pressing issue is the **alignment of WG priorities with broader sustainability frameworks**. While there is a strong focus on **technical methodologies** such as KVIs and energy efficiency, other fundamental aspects of sustainability—such as **social values and ethical considerations**—receive less emphasis. 6G4Society is working towards integrating a more **holistic sustainability approach** within the **TB Sustainability session mechanisms** to ensure that all three pillars of sustainability (economic, environmental, and social) are adequately addressed.

5.3 CONSULTATION ACTIVITIES

In addition to broader discussions, 6G4Society is engaging projects in **small group based thematic work** (~3 projects per topic) to conduct **focused collaborative research and provide proposals based on their project experiences on social sustainability values and objectives**.

The goal of these groups is to:

- Establish a **common understanding** of key sustainability objectives within 6G projects.
- Explore how these values **relate to different project types** and their implications for **network design and policy development**.
- Identify **best practices** and **challenges** in implementing social sustainability within the 6G ecosystem.

This initiative provides a structured environment for deep diving into specific sustainability issues and ensuring alignment across projects.

5.4 KVI AND SOCIAL ACCEPTANCE RELATED WEBINARS

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Furthermore, three **webinars on social acceptance** are currently being organised, targeting the SNS community, with a timeline from **March to September 2025**:

1. "Understanding and Addressing 6G Controversies: Learning from the Past, Building for the Future"

This session aims to establish a foundation for proactive engagement with societal concerns. We will explore lessons from previous technology deployments, particularly the 5G rollout, to better understand and address potential controversies surrounding 6G. We'll examine how trust dynamics develop and evolve in technological transitions, using a constructive, non-polarising approach to map and address concerns. Parallels with other sectors will be done, where social acceptance has been problematic and crucial.

Objectives:

- Exploring lessons learned from 5G deployment.
- Understanding and addressing public concerns through evidence-based approaches.
- Developing strategies for constructive dialogue without increasing polarisation.
- Introducing a reflection on a framework to analyse social acceptance in the specific context of 6G.

2. "Reframing Social Acceptance: From Outcome to Process"

This webinar will challenge the traditional view of social acceptance as a simple or predictable outcome. In particular, it will in particular with the following topics:

1. Acceptance and Acceptability: We'll explore the relationship between **acceptance and acceptability,** discussing how they don't always align and may even conflict at different Technology Readiness Levels (TRL).
2. We will explore how acceptance functions as a **dynamic and complex social process**, which extends beyond traditional approaches focused solely on user experience and technical validation and cannot be reduced to a simple formula.
3. We will present the main dimensions and categories we use to capture the multidimensional nature of social acceptance in technology deployment: social disruptiveness; user experience; trust; values impact.

   Special attention will be given to the connection between acceptance and societal **values**, highlighting how different stakeholder values can align or conflict in the technology deployment process and examining how different value systems and priorities influence technology adoption.
4. Bring in a few projects that might be interesting to share their experience, offer examples, be part of the discussion, as to what they have done so far.

3. "Implementing the Social Acceptance Framework". (in cooperation with the SNS community)

The final session would like to focus on the practical implementation of the Social Acceptance (SAT) approach. We would like to provide insights into how this framework can be applied in real-world 6G development scenarios, with discussion of specific use cases and implementation strategies. The session will explore how the framework can be integrated into

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existing 6G initiatives and projects, providing practical guidance for stakeholders involved in 6G development and deployment.

5.5 FUTURE COLLABORATION ROADMAP

Looking ahead, 6G4Society aims to **expand its collaborations a**nd **policy engagements.** 6G4Society is also actively building synergies with **SNS projects** and **standardisation bodies** to drive sustainability in 6G development. By aligning research efforts with industry standards, 6G4Society ensures that sustainability considerations are embedded into the foundations of future 6G networks. Some key planned activities include:

- **Liaison with the upcoming Sustainable Lighthouse project** – 6G4Society is actively working with CLS as a common partner to organise joint sessions focused on sustainability challenges.
- **Engaging with Call 3 projects** launching in **January 2025**, ensuring that new projects integrate sustainability principles from their inception.
- Collaboration specifically with **SNS CO-OP** (Call 3 CSA) which facilitates strategic coordination, leveraging insights from SNS OPS and SNS ICE to unify activities across 6G SNS stakeholders.
- 6G4Society has plans to **liaise with key projects** such as **6G-PATH, 6G-NTN, 6G-XR, ETHER, 5G-STARDUST, and HORSE**, and other relevant projects and initiatives ensuring cross-project collaboration and knowledge sharing.
- **Publishing and disseminating two Position Papers** including policy recommendations and best practices for a socially accepted and sustainable 6G future. Therefore, the two Position papers will cover:
    1. **Social Acceptance of 6G** – Defining Technology Acceptance Models (TAMs), addressing trust, privacy, and security, and proposing strategies for public engagement and regulatory alignment.
    2. **Key Sustainability Indicators (KSIs)** – Establishing a KSI framework, assessing economic, environmental, and social impacts, and aligning 6G development with European policy.
- **Analysing and categorising the SNS-JU Sustainability Task Force Questionnaire** – Assessing societal issues raised by 6G4Society and engaging relevant project partners.
- **Updating the Voice of the European Industry for 5G, B5G, and 6G Development & Evolution** (2022 release) to reflect the latest sustainability priorities.
- **Engaging with standardisation bodies**, including:
    - **3GPP, ETSI, and CEN/CENELEC** to gather insights on ongoing 6G standardisation efforts.
    - **ETSI's Industry Specification Group (ISG) on Multiple Access Techniques (MAT) for 6G**, ensuring alignment with emerging standards.

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- **Introducing 6G4Society's fact sheets and SAT model** into **key standardisation discussions**.

These initiatives will reinforce 6G4Society's impact within both research and policy landscapes.

6G4Society remains committed to fostering **c**ollaboration, innovation, and sustainability within the 6G research community. Through strategic partnerships, standardisation efforts, and policy engagement, the project is shaping the future of sustainable 6G networks. As 6G4Society moves into the next phase, its focus will remain on driving impactful research, fostering multi-stakeholder collaboration, and ensuring that sustainability is an integral part of 6G development.

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6 CONCLUSIONS AND TAKEAWAYS

The 6G4Society project has made significant progress in fostering liaisons and collaborations within the SNS JU ecosystem and beyond. Despite initial delays in accessing collaboration agreements, mentioned e.g. in Section 2.1 of this report, the project has successfully established a strong network of partnerships, ensuring alignment with key stakeholders and initiatives that prioritise trust, ethics, social acceptance, and overall sustainability in 6G development.

Our project's engagement with SNS JU working groups, task forces, and external initiatives has led to valuable exchanges on KVIs, sustainability frameworks, and societal acceptance models. Through our Citizen survey, webinars, joint workshops, and expert sessions, 6G4Society contributes to shaping a European value-based approach to 6G, emphasising trust, inclusivity, and environmental responsibility.

So far, key takeaways from our liaison activities include:

1. Strengthening collaborations with SNS JU projects to integrate KVIs and sustainability considerations into their frameworks.
2. Engaging with external advisory experts and global initiatives to expand knowledge-sharing beyond SNS JU.
3. Supporting standardisation efforts and policy discussions to embed societal values into future 6G networks.
4. Establishing cross-sector dialogues to ensure that technology development aligns with public expectations and ethical standards.

The way forward:

Building on this foundation, the next phase of 6G4Society's activities will focus on:

1. Identifying initiatives at Member States level to foster national-level alignment on 6G sustainability and social acceptance.
2. Aiming at organising consensus-building activities with experts to define a common KVI framework that can be used across SNS JU projects and within standardisation efforts.
3. Advancing collaborations with external organisations such as ETSI, NGMN, and one6G to ensure global coherence in sustainability and ethics integration.
4. Expanding public awareness and education efforts to communicate the benefits and challenges of 6G technology effectively.

Through these efforts, 6G4Society will continue to drive an inclusive, sustainable, and human-centric approach to 6G development, ensuring that societal values remain at the core of future network evolution.

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APPENDIX 1 - 6G4SOCIETY STAKEHOLDER MAPPING

1. General Public, Experts, Influencers, and Media:

- **General Public**: Includes non-experts, end-users, consumers, NGOs, and civil society organisations. Engagement with this group ensures transparency and inclusivity in 6G development.
- **Experts**: Comprises academia, researchers, policy experts, businesses, and enterprises, Industry Associations and Trade Organisations, Tech Conferences (EuCNC and 6G Summit), Membership/Community Organisations (ETNO, ECTA, IEEE, Digital Europe, NetWorld, and NGMN). These actors drive knowledge creation, innovation, and policy frameworks.
- **Influencers**: Academics and high-level policy experts in the 5G/6G field and those interested in the progressive deployment of 5G and 6G technologies
- **Media**: Technology and business media outlets and journalists (e.g., TechCrunch Europe, The Next Web, Telecoms.com, Wired, Techradar.com) play a critical role in disseminating information and shaping public perception.

2. Policy Makers:

EU-level Institutions:

- Directorate-General for Communications Networks, Content, and Technology (DG CONNECT).
- European Union Agency for Cybersecurity (ENISA).
- European High Performance Computing Joint Undertaking (EuroHPC JU).
- European Data Protection Board (EDPB).

European Bodies:

- European Telecommunications Standards Institute (ETSI).
- Body of European Regulators for Electronic Communications (BEREC).

Other International & Cross-Sector Entities:

- 3GPP.
- International Telecommunication Union (ITU).
- Department of Environment, Climate Change and Communications (DECC).
- European Conference of Postal and Telecommunications Administrations (CEPT).
- Radio Spectrum Policy Group (RSPG).
- United Nations (UN).
- Media, Think tanks, and NGOs.

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3. Financing Bodies:

European, Regional, and National Funding Agencies & Financial Institutions:

- European Investment Bank (EIB).
- European Investment Fund (EIF).
- European Bank for Reconstruction and Development (EBRD).
- European Research Council (ERC).
- European Space Agency (ESA).

Innovation, Research, and Strategic Initiatives:

- Horizon Europe.
- Digital Europe Fund.
- Connecting Europe Facility.
- Climate-KIC.
- Built4People.
- New European Bauhaus Initiative.

Interregional and Societal Impact Programs:

- Interreg Europe – Sustainable Growth and Resource Efficiency.
- ESF+ (European Social Fund Plus).
- Social Impact Accelerator (SIA).

4. Standardisation and Open Source Organisations:

- **Standardisation Bodies:** 3GPP, ETSI, ITU, IETF, IEEE, O-RAN Alliance, GSMA, MCX, MulteFire, MEF, TM Forum Open API, TCCA, ONF, TIA, APCO, UNECE WP29, IET, IDSA, GUTMA, ISO, ASTM, CEN/CENELEC, IEC, TI, MPEG, JPEG, EASA, UIC, National Standards Authority of Ireland (NSAI), Linux Foundation, LF Networking, Apache Software Foundation, Big Data Value Association, GlobalPlatform, Optical Internetworking Forum (OIF), Web Assembly Community Group, and World Wide Web Consortium (W3C).
- **Open Source Initiatives:** Cloud Native Computing Foundation, Cloudify, e.DO, OCCI, ONAP, ONF, ONOS, OpenBaton, OpenDayLight, OpenRoadM Multi-Source Agreement, OpenStack, OpenvSwitch, OPNFV, Eclipse, CAMARA, OpenAirInterface (OAI), O-RAN, Open-Source MANO, ETSI TeraFlow SDN OSG, Open5GCore, EDRi (European Digital Rights), OKF (Open Knowledge Foundation), OEDP (Open Environmental Data Project), EOSC (European Open Science Cloud), OMEC, Open-Source Circular Economy Days, Open-Source Wireless Router Project (OSWRP), Linux Foundation Edge, Linux Kernel, eBPF Foundation, O-RAN Software Community, Kubernetes Apps Special Interest Group (K8), Open Compute Project (OCP), Next Generation Mobile Networks (NGMN) Alliance, Telecom Infra Project (TIP), ETSI SDG TeraFlowSDN, ETSI SDG OpenSlice, ETSI SDG OpenCAPIF, ETSI SDG Open-Source MANO, OpenNetLab, Open DataHub, WAYRA, Hyperledge Foundation, and Openrail.

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5. SNS User Ecosystem:

SNS Projects and their members via the SNS working groups, The SNS JU Office and the SNS JU Governing Board, the 6G Smart Networks and Services Industry Association (6G-IA), including linkages and lessons learned from the 5G PPP ecosystem:

- **SNS projects in Call 1 and Call 2:** CSAs (SNS OPS, SNS ICE), Hexa-X-II, 6G-SANDBOX, FIDAL, 5G-STARDUST, 6G-NTN, 6GTandem, CENTRIC, ETHER, FLEX-SCALE, TIMES, 6G-SHINE, SUPERIOT, IMAGINE-B5G, TARGET-X, TrialsNet, BeGREEN, NANCY, VERGE, ADROIT6G, HORSE, PRIVATEER, 6G-XR, ACROSS, CONFIDENTIAL6G, DESIRE6G, DETERMINISTIC6G, PREDICT-6G, RIGOROUS, 6G-BRICKS, 6Green, SEASON, TERA6G, TERRAMETA. 6G-DISAC, 6G-GOALS, 6G-MUSICAL, 6G-SENSES, INSTINCT, EXIGENCE, iSEE-6G, 6G-REFERENCE, FirstTo6G, TeraGreen, 6G-XCEL, SUNRISE-6G, 6G-PATH, ENVELOPE, 6G-TWIN, ORIGAMI, PROTEUS-6G, Opti-6G, ROBUST-6G, 6G-CLOUD, 6G-INTENSE, NATWORK, ELASTIC, 6G-EWOC, SAFE-6G, ECO-eNET, and iTRUST6G**.**
- **Projects at work on KVI Linkages and social sustainability aspects:** Ongoing projects from Call 1 and Call 2 such HEXA-X-II, Target-X, Origami, Privateer, BeGreen, G6reen, TrialsNET, FIDAL, 6G-SANDBOX, CENTRIC, IMAGINE-B5G, ORIGAMI, SAFE-6G, Deterministic6G, 6G-SHINE, 6G-INTENSE, 6G-BRICKS, COALESCENCE, and TeraGreen drive research and development in alignment with Key Value Indicators (KVIs) and/or social sustainability aspects.
- **Call 3 projects joining in Jan 2025:** Among the 16 new projects, SUSTAIN-6G as sustainability lighthouse project is specifically considered as a key stakeholder.

6. 5G/6G Industry, Research, and Verticals:

- **Industry Stakeholders & Commercialisation**: Telecommunication operators, SMEs, startups, and large tech firms play a crucial role in the development and commercialisation of 6G solutions.
- **Research & Innovation**: Universities, innovation labs, and European projects provide critical insights into the scientific and technical foundations of 6G.
- **Vertical Industries & Societal Impact**: The integration of 6G with key sectors—such as healthcare, smart cities, energy, agriculture, and mobility—enhances technological advancements and societal benefits.
- **Industry Associations & Representation**: Organisations like GSMA, ETNO, AIOTI, NGMN Alliance, NetworldEurope, ESA, ECSO, FSAN, GSOA, Wireless World Research Forum (WWRF), Fira, Small Cell Forum, 5G Infrastructure Association (5G IA), 6G Infrastructure Association (6G-IA), European Satellite Operators Association (ESOA), European Photonics Industry Consortium (EPIC), Broadband Forum, 6G Platform Germany (DE), 6G Flagship (FI), one6G, 6G Forum, GeSI, Digital with Purpose, O-RAN Alliance, 5G PPP, TM-forum, Telecom Infra Project (TIP), AT - Mission Critical, EU policing bodies, GCHQ, AI RAN Alliance, IOWN (Innovative Optical and Wireless Network), Restart (IT), PEPR (FR), FNS (NL), CONNECT (IE), National 6G Initiative (SE) represent the interests of industry stakeholders, facilitating collaboration and shaping the future of 6G development.

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7. 5G/6G Non-SNS Complementary National, European, and Global Organisations:

- **International Cooperation:** Partnerships with 5G Americas, 5G Brasil, 6G Forum Korea, XGMF Japan, ENCQOR (Canada), IMT-2020 & IMT-2030 China, TSDSI (India), Beyond 5G Japan, Next G Alliance (North America), Trade and Technology Council (EU-US), ITRI Taiwan, Sparklink Alliance, NICT Japan, Open RAN Policy Coalition (North America), ARIB (Japan), One6G, 6G FORUM, Bharat 6G Alliance (India), O-RAN, Telecom Infra Project (TIP), TIP from USA NSF (Directorate for Technology, Innovation and Partnerships), NTIA (National Telecommunications and Information Administration), and other global entities foster international collaboration.
- **Complementary Domain associations:** IoT (AIOTI, EUCloudEdgeIoT), Big Data (DAIRO, BDVA), Software (NESSI), Photonics (Photonics21), Microelectronics (AENEAS), Robotics (euRobotics), Aviation (SESAR JUs), Space (GSOA, ESA. ETP4HPC, Transcontinum Initiative), and cybersecurity initiatives provide essential interdisciplinary inputs to the 6G ecosystem.

8. Related Activities and Synergies:

- **EU and Global Initiatives:** The European Green Deal Coalition, Industry and SMEs (Innovation), Peer European Partnerships, Peer associations and international associations related to vertical sectors, European 6G initiatives, Member State Initiatives at the national and regional levels, Non-SNS projects to access vertical stakeholders/value drivers and peer association collaboration contribute to strategic planning.
- **Telecom and Network Entities:** SA, ECSO, ETNO, FSAN, GSMA, NGMN Alliance, GSOA, NetworldEurope, WWRF, AIOTI, Fira, Small Cell Forum, and other telecom-focused organisations provide technical expertise and operational guidance.

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APPENDIX 2 - KVIS & SOCIAL ACCEPTANCE SURVEY QUESTIONS

Timeline: August – September 2024

Target: Call 1 & Call 2 projects

Total N/ Responders: 22 (eligible answers)

Section 1: Disruption of 6G

- How do you deem the disruption potential of 6G, as compared to previous network technology? (By disruptive we mean a technology that does not follow incremental innovation, but that it is based on new technological concepts, opening the way to new market dynamics and business models).
- From the technological perspective, under which aspects and to which extent 6G will be disruptive compared to 5G? [we would like to identify technological aspects that are expected to undergo major conceptual developments or discontinuity changes].
- Do you foresee a significant change in infrastructure compared to previous generations of wireless technology (i.e. 5G or 4G)?
- What are the main differences that you expect to see in 6G infrastructure compared to previous generations of wireless technology (e.g. the shape that infrastructure will probably take; visual impact on landscape and territories)?
- In your opinion, which of the following verticals/sectors will be most impacted on, or disrupted, with the advent of 6G technology?
- 6G will enable multiple use-cases across a number of verticals/sectors, with relative applications. What do you think will be the impact of such applications on digital divide (i.e. the fact that the access to, and the use of, some applications is more difficult or hindered for some more fragile categories of persons, such as elderly, low income, low education)?
- Do you think the public will have problems accepting 6G?

Section 2: Social Acceptance

- What approach are you taking to assess social acceptance of technology?
- What themes, aspects or approaches around acceptance are you looking at or addressing in your work?
- Are you aware of the existence of approaches and models aimed at measuring users' acceptance of technology (e.g. TAM, UTAUT...)?
- To which extent, in your SNS 6G project, do you plan to use or experiment with a model for technology acceptance, or any similar framework to evaluate user acceptance and interactions?
- Regarding TAM / acceptance related activities, if you are applying it in your project, which framework are you using?

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- Which type of stakeholders are you interacting with or plan to interact with to develop your technology?
- What methods are you using to work with stakeholders?
- In contemporary discourse, societal apprehensions surrounding 5G technology, particularly regarding electromagnetic fields, have been notable. As we look ahead to the advent of 6G, the discourse on potential impacts escalates. Through this survey, we aim to capture sentiments regarding such concerns, shedding light on societal perceptions and expectations of emerging technologies, including their potential implications on health and well-being. Are you taking any action during the development and implementation of your technological solutions, in order to anticipate, avoid or proactively address these concerns, and facilitate users' acceptance?
- What actions are you taking?
- Imagine that you are approached by a non-technical person who is relatively familiar with the topic of wireless technology and particularly 6G technology. They have concerns about the potential impact of the electromagnetic fields to health and the environment. What would you say to provide a clear counter-narrative and explanations to address and alleviate public fears related to electromagnetic exposure?

Section 3: Key Values and Key Values Indicators (KVIs)

- Is your project working on KVIs or KSIs (Key Sustainable Indicators)?
- What do you think is the key objective of integrating KVIs approaches into the technology design and development?
- When you are talking about 'value' for KVIs, what do you mean by 'value'?
- What challenges are you facing in identifying KVIs to use in your project?
- What challenges are you experiencing in applying KVIs to your project?
- How are KVIs influencing the technology development processes?
- Based on your experience, do you have any suggestions or best practices for improving the integration and effectiveness of KVIs in 6G technology projects?

Section 4: Member States Initiatives

- Can you list any ongoing or planned national initiatives that integrate 6G technology to promote sustainability?
- Please list the national initiatives you are aware of and describe their goals and current status.
- Are there any collaborations between government, industry, non-profit, the scientific community, and academia in your country that aim to leverage 6G technology for sustainability? Please list the collaborations on 6G technology for sustainability and describe their goals and current status.

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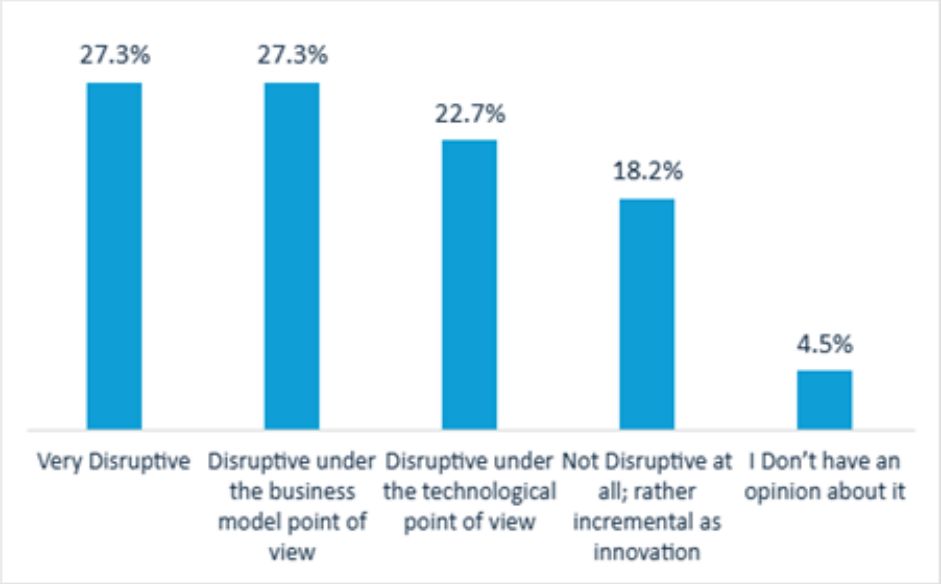
KVI and Social Acceptance Responses - Key Highlights

DISRUPTION OF 6G

(Q1) Around 70% of the respondents believe that 6G will be somewhat disruptive.



(Q4) In terms of impact on infrastructure, there is a mixed response with the majority of responders mentioning no major impacts on infrastructure. Where impacts are mentioned, there is a higher consideration for changes in the rural areas. Some respondents did not answer the question directly but rather highlighted how 6G will bring positive impacts with increased energy efficiency and create positive environmental impacts.

(Q5) Most Impacted verticals: Safety and Security, Transportation, Entertainment.

(Q6) The majority of projects (60%) tends to believe that 6G will have a positive impact on Digital Divide by increasing accessibility (demographically and geographically).

SOCIAL ACCEPTANCE

(Q7) 86% of the respondents don't think that the public will have problems accepting 6G.

(Q9): Themes, aspects or approaches addressed by projects:

- Top 3: User Experience, User Needs, Accessibility.
- Bottom 3: Adoption propensity or adoption rate, Attitude (towards using), Match with "my values" or social norms.

(Q10, 11, 12): Seven projects declared awareness of the existence of dedicated technology acceptance models and frameworks. Of these seven:

- One mentioned the intention to use a specific TA framework, mentioning the original TAM.
- 2 have a task dedicated for TA.

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- 3 said they discuss models or frameworks of Technology Acceptance in their work. (which ones?).
- 2 said they do not address TA.

(Q13) Top responses mention researchers and technology providers. However, over 50% mentions engagement with final users of the application and almost a 1/3 engage with policymakers.

(Q14) For the methods used, more than 50% of the projects selected the use of co-design/co-creation and user validation.

KEY VALUES AND KEY VALUES INDICATORS

(Q18) 17 projects working on KVIs.

(Q21) KVI Challenges:

- Top 3: Defining quantitative measures, working with qualitative data, validating KVIs.
- Bottom 3: Working with stakeholders, identifying which policy matters, assigning responsibility for implementation.

(Q22) KVIs challenges highlighted:

- Identifying KVIs for low TRL projects.
- Accessibility to stakeholders.
- Availability of baseline data.
- Comparable KVIs across Use Cases.
- Measurement and Assessment of KVIs.

MEMBER STATES INITIATIVES

(Q26) Known collaborations on 6G technology for sustainability:

- UNICO projects.
- The German 6G initiative.
- EU’s Horizon Europe and SNS Joint Undertaking.
- Finland's 6G Flagship Program.
- United States' Next G Alliance.
- China's 6G Research and Innovation Program.
- South Korea's 6G R&D Initiative.

(Q27) Knowledge of collaborations between government, industry, non-profit, the scientific community, and academia:

- NO: 13.
- ES: 6.

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