TOWARDS A SOCIALLY ACCEPTED AND SUSTAINABLE 6G

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Policy Brief on Values and Impact: the path to Acceptance and Sustainability in 6G

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1. Highlights

The 6G4Society initiative has focused specifically on investigating the social dimensions of the 6G technology environment, addressing the central question of how 6G development can be guided to ensure meaningful social and environmental contributions. In particular, it examined the way 6G development interacts with societal needs, ethical considerations, and sustainability objectives. Evidence gathered through literature reviews, exploratory surveys within the SNS-JU project community, interviews with experts and policy makers, and direct engagement within 6G-IA and SNS-JU working groups highlights both a strong commitment and willingness to integrate values, and a range of cultural and practical challenges rooted in existing economic models, innovation practices, and governance structures. Against this backdrop, this policy brief elaborates on this central question:

HOW DOES A LIMITED INTEGRATION OF SOCIAL DIMENSIONS DURING INNOVATION NARROW THE INSTITUTIONAL AND OPERATIONAL FRAMING OF SUSTAINABILITY, AND TO WHAT EXTENT DOES THIS HINDER THE ACHIEVEMENT OF A TRULY HOLISTIC SUSTAINABILITY?

Risks identified relate to values alignment, awareness about societal implications, and overall approach to sustainability.

Six main recommendations are proposed:

1. Make **social desirability** a transformative driver within the technological process;
2. Support activities and capacities to manage the complex **relationship between values and technology,** so that relevant social **values are meaningfully integrated** in the innovation process;
3. Promote mechanisms to proactively anticipate, assess, and guide the broader **societal impacts** of future network technologies;
4. Investigate further **ethical and societal issues** arising from immersive communication environments from an ethical and sociological point of view;
5. Overcome the trade-off logic, supporting the transition towards **sustainability as an integral value and strategic driver** within innovation processes;
6. Ensure a comprehensive interpretation of **environmental and social sustainability** in research and innovation processes.

2.Context of the Issue

The 5G Infrastructure Association described 6G as "one of the basic foundations of human societies of the future." [1], underscoring the pervasive and profound societal impact 6G is expected to trigger. The magnitude of this transformative potential is matched by significant commitments as to its role and mission in society. As elaborated in both institutional and industrial strategic documents, 6G is envisioned as a transformative technology whose ambition extends beyond technological advancement and performance metrics. 6G is considered for its potential to enable a wide range of critical services across multiple sectors, and in particular, to **enable sustainability**, as it can support major polluting sectors—such as transport, agriculture, and construction—in reducing their environmental footprint.

A major conceptual shift accompanies these goals, represented by the expressed ambition of incorporating value-oriented objectives in the design paradigm as of the onset, representing **intangible yet fundamental human and societal needs**. This evolution is explicitly elaborated in the strategic orientations of the SNS JU, which positions future smart networks and services in support of European policy priorities, including the Green Deal, and of a sustainable and secure internet [2]. Further, the European Sustainability lighthouse project Sustain-6G concretely collects this commitment [3], with the mission of exploring 6G sustainability in a holistic way across the three environmental, economic, and social pillars. Altogether these developments signal a profound **cultural shift**, conceiving the advancement of next-generation connectivity as inseparable from the responsibility to foster societal well-being, protect fundamental rights, and support long-term planetary health.

It is within the space between the pervasive transformative potential attributed to 6G, and the desire to build a system based on social and ethics values, that the reflections of this policy brief develop. **Triangulating the concepts of values, impact and sustainability,** 6G4Society has explored and critically interpreted the work conducted within the SNS JU and 6G-IA ecosystem, analysing how the transformative contribution of 6G in society, as well as final objective of holistic sustainability, are being interpreted and addressed in R&I projects.

Gaps at the **governance and practical levels** emerged as well as **cultural and methodological barriers** and **challenges** that remain to be addressed to effectively translate high-level commitments and principles into the concrete day-today implementation of innovation processes. In particular, through the lenses of the Responsible Research and Innovation framework [4], innovation processes appear still falling short of the principles of reflexivity, anticipation, responsiveness, inclusion and participation, which are foundational to achieve the above-mentioned goals. This process demand awareness, openness to challenge assumptions, and ultimately dedicated guidance and capacity-building.

The first issue relates to the dimension of values, to how it influences both high-level strategic orientations and the practice of technology development. Dealing with values is inherently complex because values—whether at the individual, corporate, or institutional level—are often implicit and rarely acknowledged in a deliberate or conscious way. This difficulty translates into biases and limitations in how the strategic level and the implementation level reflect social values.

Strategic orientations guiding R&I tend to be shaped by the priorities, values, and viewpoints of limited stakeholders—primarily the industrial sector and technical communities. Overall, the decisions orienting future development tend to be grounded on what technology can achieve, rather than on what society may genuinely and deeply need. Considerations such as technological feasibility or market potential frequently prevail over broader cultural, and social implications; also, the persistence of a paradigm treating hyperconnectivity as an unquestioned and intrinsic value introduces inherent biases in the foundational elements guiding technological objectives. The result is that **current research and innovation (R&I) practices risk projecting a narrow-scoped vision of possible futures** to be designed and pursued, by overlooking the diversity of societal perspectives and aspirations. This translates into missed opportunities for a more disruptive and inclusive explorations of how human and societal development might evolve.

At the level of **technology implementation,** value-related considerations raise significant challenges. Despite innovation actors being increasingly expected to define and manage the value dimension within technology development processes, evidence from 6G4Society confirms that many technical experts still lack the multidisciplinary expertise that is needed to navigate the complex interplay between values and technology and to recognise how cultural values shape innovation, especially at low TRL levels. This competence gap, combined with challenges in identifying and engaging relevant stakeholders early on, results in **value-related considerations being addressed predominantly at later TRL stages,** and with a **partial and/or biased reflection of social values** in the innovation process. The potential for value-based design at the earliest stages of technology development, when flexibility is greatest, is therefore constrained, together with the possibility of truly steering technological development toward ethics, values, and social good considerations in technology design.

The second issue where the risk of narrow scoping of the future emerges, is in the way impact is described and addressed within the current technical R&I culture. What became evident is the tendency to act on the assumption of a beneficial effect of technology as concerns its impact on society, with limited awareness of the potential negative and unintended social implications that technologies may generate beyond their intended or sector-specific impacts. As a result, a number of social impacts—related to the creation of broader value for society or linked to the transformative impact of the digital world on individuals —are often not sufficiently taken into consideration and reflected in the R&I design or assessment processes. This affects - and compromises - in turn: the definition and calculation of costs and benefits - pains and gains; the capacity of identifying in due time social values or rights that are either at risk, or that require a new recognition and protection; the breath and scope of KVIs and their capacity to capture longer-term impacts, beyond the project lifetime. Overall, these aspects can compromise the capacity of comprehensively scoping and addressing the social sustainability dimension. Immersive communication environment has been especially recognised as an environment liable of profoundly reshaping society and human experience, calling for a more responsible, anticipatory, and reflexive approach to innovation, in line with the European Commission strategy on Web 4.0 and Virtual Worlds (the "metaverse") [5]. Important and specific dimensions have been identified in the context of 6G4Society work, through the lenses of social theory and media studies, highlighting needs and opportunities for further ethical and social research. These dimensions include: the reconfigured relationship between body, space, and environment; the blurred boundaries between reality and imagination in the virtual world; the relationship between physical and virtual social space; the perpetration of stereotypes in the virtual world; the role of mediation in immersive communication environments.

The third and last dimension analysed regards sustainability - as a value and as a set of practices - and the way it is addressed within the industrial R&I culture.
Overall, sustainability continues often to be framed as a trade-off, or as a secondary or external consideration, rather than being integrated as a core priority. It remains frequently associated with notions of constraint, burden, or renunciation, and is often perceived as standing in tension with objectives such as competitiveness, performance, and profitability. In most business contexts, sustainability has not yet evolved into a genuine guiding principle and still fails to contribute to shaping innovation strategic objectives in a transformative way, informing the design and development of products or business models, and ultimately stimulating a real paradigm shift.

This partly derives from sustainability not being widely recognised as a source of business value in terms of market positioning, reputation, or product and service offerings. This scenario points to two important aspects: on a practical side, sustainability risks to remains peripheral to industrial research and innovation agendas, core business models, and decision-making processes, resulting in only a superficial and compliance-oriented exercise, failing to evolve into a genuine driving force and source of business value.
On a cultural side, this scenario embodies a disconnect from the fundamental values that should underpin responsible and future-oriented development, reflecting the persistence of a deeply rooted cultural and value framework still oriented towards different priorities.

Final considerations regard the way in which the concept of **social and environmental sustainability is interpreted** in the context of R&I innovation agendas and practice. Some nuances and aspects that are constitutive of the concepts are currently not taken into account and not reflected into R&I processes. This perceived lack of relevance may derive from: **a low priority attributed** to these topics within programmatic research priorities (work programmes); a **difficulty in meaningful interpreting** these sustainability dimensions and research in the contexts of innovation priorities, targets and operations; **missing specialist competences** to properly address these aspects.

A proper understanding of these aspects is important to avoid negative social and environmental rebound effects from the digital transformation. Also, in the specific context of the SNS JU, the community has manifested the willingness to transitioning from a trade-off logic and approach, towards **co-optimisation** approach [6], as a way to guarantee **a more holistic alignment** between technological advancements and broader sustainability objectives.

The capacity to devise concrete cooptimisation strategies, however, remains a critical challenge. Appropriate support mechanisms are needed to support industry in this effort, to avoid treating conflicting variables as competing interests, and to ensure that a performance-oriented culture does not overshadow broader sustainability considerations. This need was first raised here [6] and then reaffirmed in occasion of EuCNC.

In conclusion, a key insight drawn from these analyses is the dominance of certain perspectives in addressing concepts such as impact, need exploration, and key values – often resulting in partial, technology-centric interpretations that can obscure broader societal considerations. Considered these issues, 6G4Society underscores how any such limitations - on capturing social needs, understanding societal impact, incorporating values in the innovation process - may **relapse on the way sustainability is scoped and enabled, ultimately hampering the possibility to realise sustainability in a holistic way.**

3. Policy Recommendations

R1

Make social desirability a transformative driver within the technological process

Research priorities must be able to integrate and embrace social desirability as a driver and as a criterion informing choices. This entails openness to capture different, alternative visions and priorities as to the desired lifestyle for the future of our society, even in discontinuity with taken for granted and dominant positions. This requires a cultural shift and a redefinition of the role of technology in society, to overcome the current technology driven paradigm, with the awareness that decision at each design phase can shape future societies. Research and innovation orientations, technological priorities, use-case prioritisation, and approaches to problem-solving shall be shaped around different assumptions, questioning on the one hand the need for certain innovations, and understanding – on the other hand – the orientation and priorities of society. This implies the opportunity of consciously selecting and prioritising specific human principles and visions for the future, independently from immediate or technology driven market opportunities.

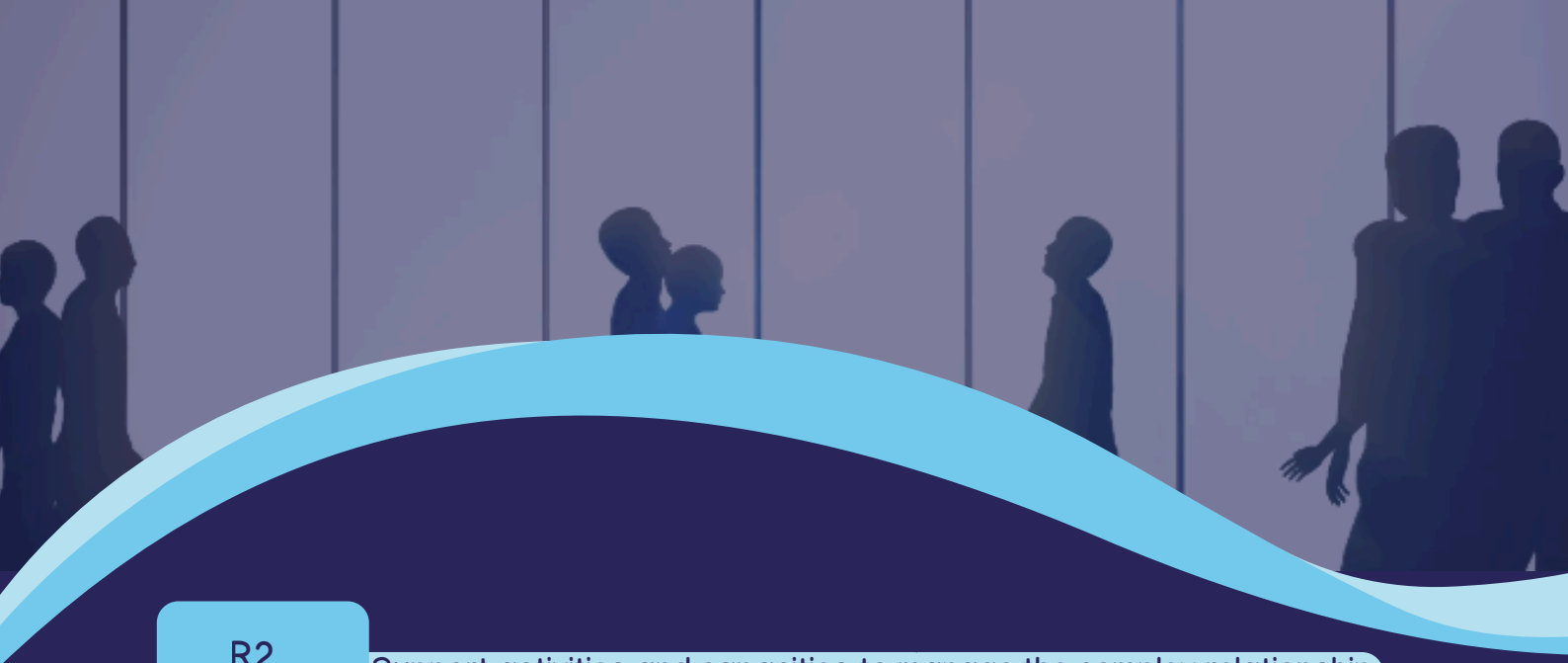
Social desirability can be actioned in R&I at different levels through outlining specific requirements at the level of funding mechanisms. Main dimensions of change relate to the approaches used to define or identify social needs, to define social acceptance, to cure the relationship with the stakeholder system, including the way to manage conflicting situations.

The perspective of who has a legitimate stake in technological innovation shall be extended beyond the community of business, technical and industrial specialists and beyond final users, including those groups or communities that may be indirectly or negatively impacted – or which perceive themselves as negatively impacted. The objects of exploration should include needs, priorities, driving values, or potential tensions.

Social acceptance shall not be conceived as a goal to achieve, but as an ongoing process to explore and critically examining whether the value envisioned by industry aligns with actual social needs, identifying potential gaps between technology-driven objectives, underlying assumptions on societal priorities, and the perspectives of underrepresented groups. This, not to dismiss business objectives, but to widen their perspective and conception in terms of social value creation. This would ensure a comprehensive exploration and elicitation of societal needs across social groups, and relative important social values.

Such turns are essential to promote a critical examination and elicitation of what social values and assumptions are being promoted and reinforced, or challenged, through current innovation trajectories, getting to shape orientations, pathways, and decisions.

- **Overturn the approach to social acceptance, from goal to exploration,** widening its scope of investigation, targeting a wider range of stakeholders (beyond final users) and the socio-economic contexts beyond the scenario of use – e.g., the socio-political, community or market level.
- **Support the creation of a new culture of stakeholder engagement in the telecom sector.** This could be done on the lines of the quadruple helix model – aimed not only at a comprehensive needs exploration but also to challenge driving assumptions.
- **Tune towards conflicting or divergent voices, embracing controversies as a way to elicit and explore diverging social values and social needs.**



R2

Support activities and capacities to manage the complex relationship between values and technology, so that relevant social values are meaningfully integrated in the innovation process.

Practical and structured guidance shall be provided to practitioners, to support the identification and articulation of values across the innovation process, understanding when and how they emerge, and in which ways they exert influence and become available for assessment. Guidance and capacity building shall focus on three main levels in which values influence and relate to the technology work: 1) **Elicitation of values** as guiding (and often implicit) principles defining purpose and orienting strategic or technical decisions; 2) **Integration of values** into design and development processes as of the earliest stages; 3) **Translation of key values into KVIs**, providing clear rationales, methodological steps, and examples to help teams navigate different options.

These capacities, aimed at promoting responsiveness to societal priorities, find applications into innovation processes under the form of different activities. These activities may scope from the capacity of mapping different perspectives across stakeholders, to that of translating and embedding insights into technology design decisions, evaluation criteria, or project objectives. Further elaboration on the complex interplay between values and technology, and on how values act throughout the research and innovation process, is provided in two dedicated 6G4Society Insight Reports, [7] and [8].

- **Promote the presence of specific competences in R&I activities aimed at addressing or integrating social values or ethical issues** – notably from social sciences and cultural studies – to provide and deliver practical guidance to practitioners to identify, manage or integrate values throughout the innovation process.
- **Supporting a specific Coordination and Support Actions (CSAs) to provide cross-cutting support and expert service to the SNS JU community** (also to low TRL projects) on the ways values and technology intersect. Outputs could take the form of guidelines and practical toolkits, including methodological approaches, templates and reflection prompts, and case examples to facilitate systematic engagement with values in technology R&I.

R3

Promote mechanisms to proactively anticipate, assess, and guide the broader societal impacts of future network technologies

A new way of approaching and understanding ICTs impact is needed in the industrial culture, which complements the study of more immediate and intended social impacts with a broader comprehension of the transformative effect that technology triggers on several fundamental aspects of human experience and social organisation. Assessing 6G's potential impact (and implications) at the societal level requires awareness on the complex set of dynamics ignited at the cultural, social and individual levels (cognitive, psychological, identity-related, relational, mental health aspects). These levels can be problematised, explored and anticipated (although not predicted or assessed), and shall be addressed as of the earliest stages of the R&I process. This requires leveraging on complementary knowledge, competences and methodologies, in particular from the social sciences realm.

A number of anticipatory approaches help bridging the gap to capture the broader, systemic, and long-term transformations that technologies trigger in society, by revealing potential second-order effects and societal dynamics that conventional methods do not capture. These are, for example: Constructive Technology Assessment (CTA), Value Sensitive Design (VSD), Socio-Technical Integration Research (STIR), scenario building, foresight and backcasting exercises, Technology Foresight Assessment (TFA). In the operations of the SNS JU ecosystem such methods would help complementing existing innovation practices, by expanding innovation targets from technical feasibility and performance, towards a more substantial pursue of social desirability, long-term societal relevance and ethical soundness.

- **Make the integration of social science competences a requirement in topics where future and emerging technologies are studied,** in order to integrate as of the onset an anticipatory perspective and therefore capture aspects liable of complex and possibly controversial societal implications. The importance of a multidisciplinary contribution could be made more explicit in future SNS JU Work programmes, where the involvement of SSH experts could be established as a necessary and structural condition for projects addressing social and sustainability dimensions.
- **Promote tools and methods for the anticipatory exploration of possible broader societal implications of technology.** This integration could be directly operationalised within specific technical topics, or through dedicated CSAs, aimed at devising targeted methodological guidance, training, and support for anticipatory reflection at different TRL stages.

R4

Investigate further ethical and societal issues related to immersive communication environments

Three research paths are here proposed for further exploration. Further explanations and elaboration on the relevance of these topics, together with academic references, can be found in chapter 3 of 6G4Society D1.1 [9], and in [10].

Immersive communication as new communication mode: Immersive communication is considered by some communication sciences and media theory scholars a new communication paradigm [11], for the extent to which it is expected to impact on communication cate-gories that participate to the generation of meaning – space, time, human body presence, non-verbal communication. The investigation of relevant and constitutive dimensions of this new communication and media paradigm from the social dimension and media theories point of view is suggested. This shall include the study of how the capabilities and influences of "mediation" changes within the processes of meaning creation, while evolving towards increasingly naturalised" and immanent forms. Risks such as emotional manipulation, bodily surveillance, or dependency on immersive environments shall become object of reflection, while reflecting on which values should be safeguarded —autonomy, authenticity, inclusivity, well-being—as immersive communication and XR become central to cultural production and experiences.

Narratives, stereotypes and values reinforced by games: The gaming experience evolved lately from pure entertainment, into platforms for socialisation, learning, and identity-building. This raises relevant questions as concerns the development of contents in the gaming industry, as through gaming experiences different values may be transferred and reinforced in society. Currently, games contents often develop in contexts of competition, violence, or war, reinforcing values -and experiences- such as dominance, conquest, and rivalry.

In addition, games tend to reflect stereotyped representations of female characters. Research shall be supported to investigate the role of gaming experiences in the context of social sustainability and of social values reinforcement. The focus could relate on critically assessing how social stereotypes risk of being reinforced (e.g. gender or minorities representations) and how, conversely, games could be designed to foster positive values such as exploration, cooperation, diversity, equity or inclusion. Also, research could focus on the influence of gaming in the shaping of self and social identity; or on emulation risks connected to virtual experiences constituted by violence or aggression.

The relationship between physical, virtual, real, and imaginary spaces: The immersive potential of XR technology generates vivid experiences and real emotions, transforming the relationship and type of interaction between physical, virtual and imaginary space. The ethical implications are profound: while immersion can enrich creativity, learning, and cultural expression, excessive engagement risks to entail detachment from the physical world, and to weaken the ability to distinguish mediated from unmediated experience, potentially leading to confusion or disconnection from one's physical surroundings and social relationships. Further research shall be done on how physical and virtual experiences are articulated across real and imaginary, affecting not only individual well-being but also social sustainability.

- **Foster multidisciplinary research on the ethical and societal implications of immersive communication and XR environments,** with the mandatory contribution of SSH disciplines (e.g. social sciences, communication sciences and media studies, cognitive sciences, psychology) in the above-described specific topics.

3. Policy Recommendations

R5

Overcome the trade-off logic, supporting the transition towards sustainability as an integral value and strategic driver within innovation processes

There is a need to overcome the trade-off culture and to foster a culture where sustainability is not felt as a burden or external constraint, but as an integral, strategic asset, a way of living and working, a principle that naturally guides how activities, products, and systems are designed, produced, and managed. Actions at different levels are needed:

Assigning to sustainability a higher priority in research and innovation programmes, making it less negotiable. In the same way that security, safety, and quality are treated and socially perceived as essential dimensions of performance and value, and not perceived as limiting constraints, so sustainability shall be assigned a higher priority, as an element strengthening long-term resilience and ecosystemic well-being. This is especially crucial as concerns enabling aspects for circular economy.

Creating positive narratives and evidences, tailored for the telecom sector, on how sustainability and ethical responsibility can become integral part of businesses and create tangible value. Virtuous examples from project-level experimentations, or beyond, shall be gathered. The aim is showing how embracing environmental sustainability goals and transforming operation modalities. Example shall cover different stages of the value chain, from design and infrastructure choices, to service provision and end-of-life management, with special attention to options and experimentations on innovative viable business models. Investigating both economic and cultural barriers to explore: the cultural grounding behind the persisting perception of sustainability as an obligation and burden, rather than opportunity and an intrinsic value; international cooperation strategies, opportunities and competitive challenges related to the integration of sustainability in competitiveness and investments outside the EU; customer acceptance and market adoption dynamics related to sustainability-centred value; this includes leveraging on the growing awareness of the public, and on the potential of marketing to promote sustainability as a competitive, intrinsic value. **Setting up a support and guidance mechanism to accompany industry in the transition.**

Guidance and steering are needed by industry from policy makers to navigate choices and options within a context aiming at holistic co-optimisation. Dialogue, orientation and governance is required as concerns: setting conditions for use (e.g. applying the principle of frugality to avoid unnecessary bandwidth usage); establishing thresholds and limits (e.g. of carbon emissions, or EMF); prioritising achievements and targets; establishing rules for what the technology can and cannot be used for; distinguish between what constitutes a legitimate trade off - expression of specific contextualities - and what represents the perdurance of traditional priorities and values (performance, profitability) at the expenses of other interests (e.g. environment, ecosystem, biodiversity, etc.).

- **Integrate in R&I work programmes precise requirements, to support a transition towards circular value chains as of technologies conception phase.** Specific requirements shall be set to explore the design of products (as of the earliest stages) also in view of their end-of-life management. Accent shall be put on exploring long-lasting, repairable, and modular designs, assessing any impact on performance or reliability. Equally, the exploration of business models not based on selling products, but on product as a service, shall be promoted where relevant.
- **Support the cultural transformation, building different narratives and evidences** tailored for the telecom sector, based on experimentations and experiences from projects, giving evidence on how sustainability and ethical responsibility can become integral part of businesses and create tangible value, showing how to adapt operation modalities and assumptions at different stages of the telecom value chain, or creating innovative viable business models (e.g. adaptable user experience; "product-as-a-service" principle). This objective could be supported by a CSA.
- **Create a guidance mechanism, or a stable institution-industry dialogue,** to steer and navigate choices and options within a context aiming at holistic co-optimisation, beyond a trade-off culture.

R6

Ensure a comprehensive and contextual interpretation of environmental and social sustainability in research and innovation processes

There is a clear need to clarify and contextualise what environmental and social sustainability mean in the context of future network technologies. Not only specific nuances, aspects and objectives shall be better defined, but also the way such aspects relate, directly or indirectly, to the work of SNS-JU projects, including low TRL ones, shall be illustrated, through concrete examples and contextual explanations. This would make it possible to draw a thread, linking technical operations to long-term, systemic social impacts.

Aspects relevant to correctly scope the concept of social sustainability, and currently not fully addressed are: mental and physical health and wellbeing; cultural heritage; cultural identity and diversity; sense of belonging; feeling of being safe in a community, and of being part of a community; community prosperity; intergenerational justice; equity in the way assets, resources and benefits are distributed; societal resilience; social cohesion; participation and empowerment; autonomy; freedom; dignity; right to disconnect or not to be connected; landscape preservation; quietness and unspoiled nature.

Aspects relevant to correctly scope the concept of environmental sustainability, appearing a less addressed within the activities of SNS-JU projects are: greenhouse gas (GHG) emissions; electromagnetic field (EMF) exposure; circularity; impact on biodiversity; landscape preservation; quietness and unspoiled nature.

As concerns **social sustainability**, the visions, narratives and approaches proposed by industry on future social scenarios or to address social challenges shall be analysed through social sciences competences, to highlight ethical or social issues requiring attention for their potential wider societal implications (also for works at low-TRL or on enabling technologies).

As concerns **environmental sustainability**, there is a need to explore, verify and demonstrate how and to which extent (under which respects and focus) aspects currently left behind (e.g. GHG, circularity, biodiversity) are possibly relatable to technology-focused, low TRL work, in view of value-based design considerations. Specific competences shall be required to address such areas (GHG, circularity, biodiversity).

- **Support multidisciplinary actions aimed at better defining and contextualising environmental and social sustainability aspects in the SNS – JU realm,** clarifying focus, meaning, relevance and links between the sustainability dimensions listed above – currently less covered – and specific areas of action of SNS-JU operations.
- **Promote a dedicated CSA** to work cross-cuttingly with SNS JU projects, with the aim of operationalise the work above (mapping the relevance of environmental and social sustainability topics against SNS JU projects areas of intervention)
- **Integrate requirements into R&I work programmes to consult or involve specialists** in environmental sustainability areas that are currently underrepresented, particularly circularity, GHG emissions, and biodiversity. This should be done with the aim of exploring the extent to which these areas are relevant and addressable already in the earliest phases of technology exploration and development, ensuring thus sustainability by design.

4. Evidence and analysis

The project's findings at the basis of these policy briefs are based on the analysis of multiple sources and the triangulation of quantitative (surveys), qualitative (interviews and workshops), and desk-research methods. Sources have been analysed through the analytical lens of Responsible Research and Innovation (RRI) and Science and Technology Studies, and comprise scientific literature, participatory workshops, surveys and interviews with R&I practitioners from SNS JU projects, a citizen survey, consultations with policymakers and experts on topics such as social acceptance, 6G, green ICT, smart cities, and sustainability.

Other key sources to understand approaches and methods applied by industry in matters of social needs, social values, social acceptance and KVIs, have been: a **survey** to explore the SNS JU projects' community [12]; the direct engagement within the **SNS JU community working groups** (e.g. SNS JU Sustainability Task Force); the constructive face-to-face exchanges and collaborative work conducted for two **EuCNC** events; the active participation in technology-focused SNS JU projects. Combined, these sources and methods offer a complementary view across diverse stakeholders of how societal values and needs are currently represented and operationalised in 6G research and innovation. Here a synthesis of the main findings.

The way social and societal **impact of ICTs** are generally conceived and approached is important to the cause of sustainability. It emerged how the impact of ICTs is rarely addressed beyond the description direct and intended effects of technologies, and is mostly viewed as inherently positive. A particularly interesting context where social implications should be further and more broadly investigated - and with anticipatory approach - is that of **immersive communication.** In this context, the relationship between human, technologies, media and the environment will be subverted, calling for specific reflections. The identification of sensitive ethics and sociological aspects in immersive communication is rooted on interpretative categories and knowledge proper of social theory and media studies, and especially on the notion that communication environments not only determine how contents are produced and conveyed, but they also structure the way audiences perceive and interact with these contents, influencing the relational affordances of society. We have further explained these aspects in chapter 3 of our D1.1 [9].

A narrow awareness and vision on possible societal implications may undermine the substance of sustainability actions - **compromising especially the social sustainability** dimension. This narrow framing of impact reflects a more general issue pertaining the **perspective** used to define innovation outlooks and targets.

The analysis of project documents and the collection of expert views through interviews and direct interactions in EuCNC, confirmed a general framework already well elaborated upon by the RRI theory. Innovation **paths appear still shaped by a narrow set of actors and values,** with limited importance attributed to the point of view of non-specialists in defining the trajectories of future technologies, and ultimately, of the future of humanity. This leads to reproducing a vision of the future that reflects **assumptions, visions and priorities** proper of industrial actors. In this cultural and value context, technology tends to be considered as the solution to most of the problems (**techno-solutionism**), universal connectivity is mostly framed as **inherently beneficial,** and **societal progress** tends to be treated as a by-product of technological advancement. Innovation is frequently associated with technological advancement, with the concept of innovation mostly associated to that of technological advancement.

Such a vision of the role of technology in society relapses also in the way **social acceptance** is conceived: acceptance is mostly treated as a goal to be achieved, typically through persuading people of the benefits of technology, and reflecting a traditional "**technology push**" model – where companies create demand rather than respond to real societal needs.
Considering that innovation choices shape the boundaries and affordances of future human civilisation, the dominance of a partial perspective raises concerns about the ability to genuinely **capture the diverse needs of society** and to remain responsive to its evolving needs and values.

Shifting from a more strategic level, to the practical and operational one, the work of 6G4Society across SNS JU projects, combined with insights collected at EuCNC 2025, highlighted that **values represent a terrain of both ambition and challenges for technology projects' practitioners.** Teams have shown difficulty in translating the value dimension into practical management (e.g. understanding what constitutes a social value, which values to identify, where to look for them, how to derive them), with some using user experience as a more accessible – though not appropriate – proxy for societal values. Regarding Key Value Indicators (KVIs), most projects reported significant difficulties engaging with this concept, especially in low-TRL, technology-focused environments. More broadly, regardless of the TRL level, KVIs are still not being used as a guiding tool for design.

Finally, **insights regarding sustainability** are derived from active contributions to the analytical work conducted within the SNS-JU Sustainability Task Force, complemented by interviews with national and European policymakers. These findings are further enriched by direct and participatory observations gained through involvement in project consortia activities. A key analytical perspective relates to **how the discourse on environmental and social sustainability is framed.**
Environmental sustainability is mostly framed around the **need to mitigate negative effects**, leading to treat the relation between economic and environmental sustainability as a continuous **trade-off. Social sustainability,** instead, is often framed around a **generic positive assumption** that technologies can solve social problems. This, combined with a still low awareness on the societal implications of ICTs, may lead to overlook important nuances and categories of values, relevant to define social sustainability in the context of future networks and connectivity.

5. Sources

This policy brief synthetises findings from 6G4Society Deliverables D1.1 [9], D1.2 [13] and D1.3 [14]. In addition, this work draws from activities and outputs realised under WP2 and WP3, and in particular, 6G4Society SNS Survey Report 2024-2025 [12], based on two survey rounds conducted across the SNS JU project community; 6G4Society Insight Report #1 [7]; 6G4Society Insight Report #2 [8].

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