Sustainability Lighthouse

Towards Sustainable 6G by Design

SUSTainability **A**dvanced and
Innovative **N**etworking with **6G**

SUSTAIN-6G project

Facts & figures, Objectives, Methodology, Implementation

Quick Facts & Figures

Call

- EU HORIZON-JU-SNS-2024-STREAM-B-01-07 Sustainability Lighthouse
- R&I TRL levels 2-5 (Technology concept – Technology validated)

Project Management

- Project Coordinator: Christoph Schmelz, Nokia, DE
- Technical Manager: Olivier Bouchet, Orange, FR
- Innovation Manager: Anastasius Gavras, Eurescom, DE

Timeline

- January 2025 – June 2027 (2.5 years)

Budget & Effort

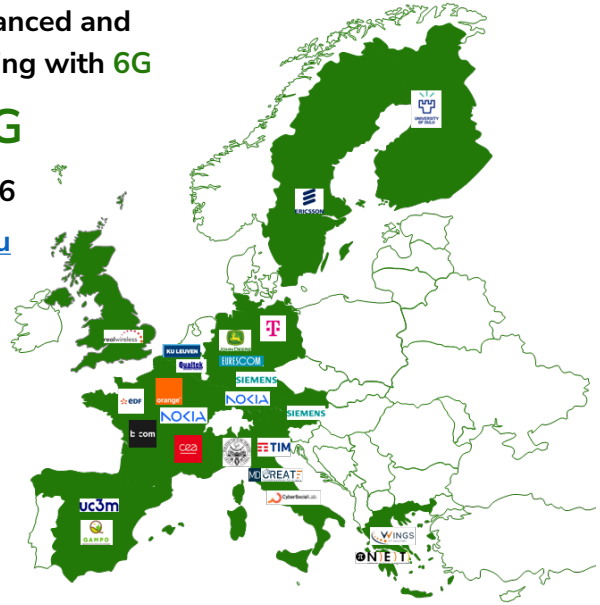
- Total effort: 1210 person months
  (= 40 full-time employees over 2.5 years)
- Total funding: 13 M€

SUSTainability Advanced and Innovative Networking with 6G

SUSTAIN-6G

Project # 101191936

https://sustain-6g.eu



Telco: NOKIA, orange, T-..., TIM, EURESCOM Innovation through Collaboration, ERICSSON

Vertical industry: SIEMENS, JOHN DEERE, EDF

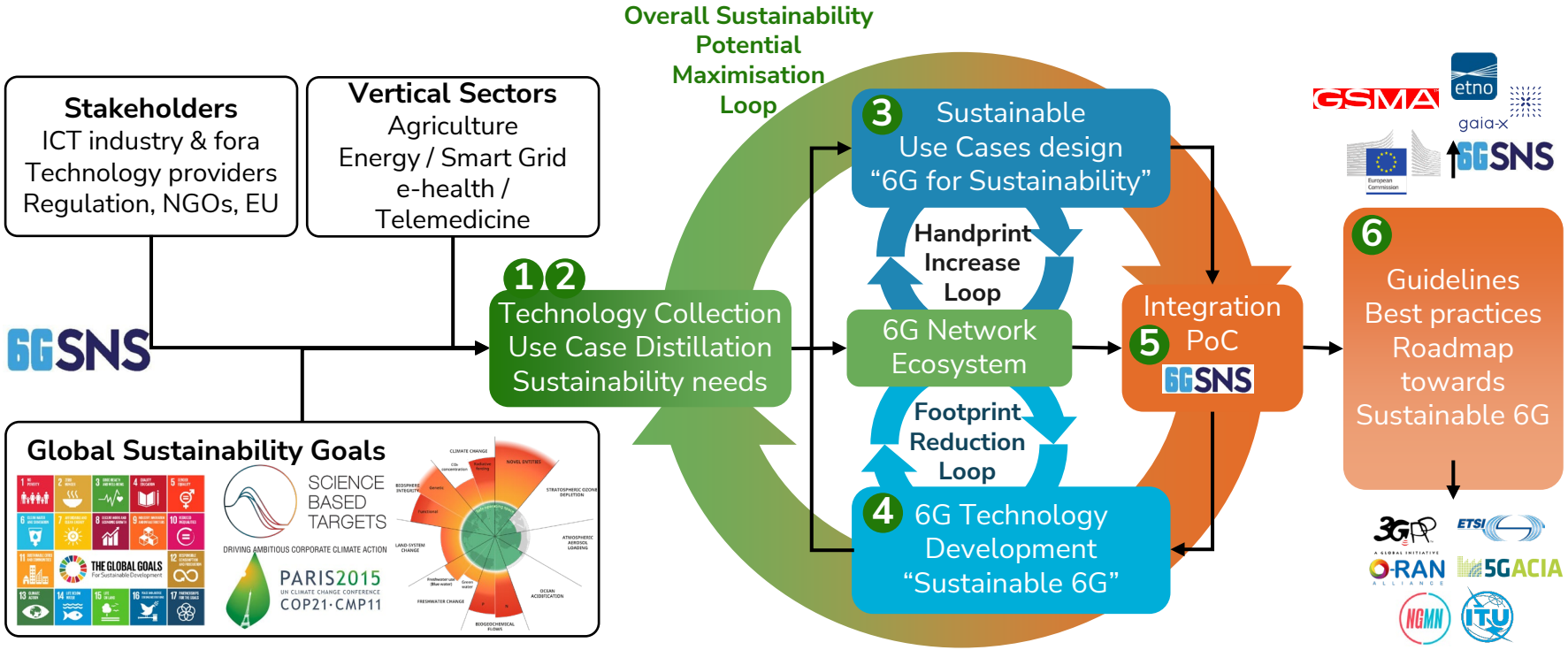
Academia: uc3m, University of Oulu, Politecnico di Torino, CEA, KU LEUVEN

SMEs: realwireless. independent telecoms experts, b.com, ONE2NET, WINGS ICT SOLUTIONS, Qualtek Thinking Forward, CyberSocialLab., QAMPO, MD CREATE Innovative solution for surgery

Objectives

1. Identify and understand sustainability needs and values
2. Define methodologies for sustainability definition and assessment
3. Enhance integration of vertical UCs with 6G and enabling technologies to jointly reduce footprint and maximise handprint
4. Enhance 6G technologies to reduce footprint and increase handprint
5. Validate, evaluate, and demonstrate sustainability value
6. Impact generation, sustainability guidelines and strategic roadmap

Methodology



Sustainability scope

A holistic view on all sustainability dimensions is required

	€ $ ¥ £ Economic	Societal	Environmental
Sustainable 6G	Long-term business viability & scalability Market competition & innovation Industry collaboration & partnerships Cost efficiency & resource optimisation Economic growth Regulatory framework & policy support	Bridging the digital divide (accessibility) Trustworthiness & Responsible AI Stakeholder engagement Ethical business practices Social well-being Cultural diversity Technology ethics	Net zero network design, deployment and operation Use of renewable energy sources Environmental data collection Storage and analysis Material usage and circularity Environmental Total Cost of Ownership
6G for Sustainability	Digital transformation Innovative business models Workforce development Opportunities for SMEs Value network integration Global reach Social & economic inclusion	Digital equity Services with high societal value Personal privacy and data protection Ethical business practices Reliable, resilient and accurate information Support for democratic values	Vertical-specific environmental challenges Biodiversity & geodiversity impact Optimisation of natural resources Monitor & reduce emissions Supply chain improvements Smart energy management Sustainable mobility

Sustainability in the context of 6G has 6 Dimensions

Project motivation

"Sustainable 6G by Design" still has shortcomings

Handprint and footprint cannot be targeted in isolation

E.g., interrelation / trade-offs between ICT and vertical systems

Most current solutions have limited domain scope

E.g., RAN, NTN, transport - scattered landscape

Sustainability needs a holistic approach

- **Jointly "Sustainable 6G" and "6G for Sustainability"**
- **E2E from device to service across network domains**
- **Consider full lifecycle, interdisciplinary for all sustainability areas**
- **Validate, evaluate, and proof solutions**

Incomplete coverage of sustainability by current solutions

E.g., only energy efficiency during operational phase

Sustainability-related solutions are not yet applicable

E.g. KVI process, metrics definition, standards

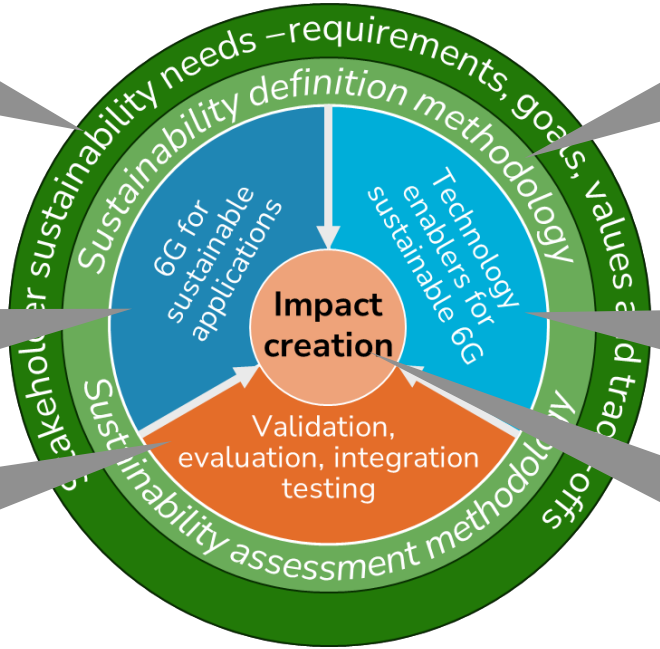
Research & innovation questions

What needs to be addressed towards a holistic “Sustainable 6G by Design”?

What is “sustainability”?

How can 6G help to make vertical applications sustainable?

How can “sustainability” be implemented?



How can “sustainability” be quantified?

Which technical enablers make 6G sustainable?

What do standards and regulation need to fully integrate sustainability in 6G?

Project approach

Research & innovation areas

Sustainable 6G "BY DESIGN"
Holistic, End-to-End, Full Lifecycle

Sustainability definition framework

Common E2E goals & values

Use Case & 6G values & metrics

Trade-offs

Sustainable 6G Technology

RAN/Core/Optical Energy Savings

Security / Privacy

Sustainable AI

Network/Service/ Data management

6G for Sustainable Applications

Integration of 6G with vertical UCs:

Healthcare

Energy Smart Grid

Agriculture

Sustainability assessment methodology

Framework for evaluation of E2E sustainability impact (device to application)

Proof-of-Concept implementation and integration

Evaluation of E2E sustainability Impact

Consolidation of results towards **Guidelines** and **Strategic Roadmaps and Policies**

SUSTAIN-6G project

Hexa-X-II heritage

Design 6G to deliver value and to be sustainable

Sustainability is the key value and driver in Hexa-X-II, encompassing the three pillars…

- Environmental sustainability
- Social sustainability (incl. Trustworthiness and inclusion)
- Economic sustainability

… the duality

- **Sustainable 6G**: 6G should be inherently designed to meet sustainability commitments (NetZero,…)
- **6G for sustainability**: 6G-based services enabling other sectors/verticals to minimize their impact

… and involve society

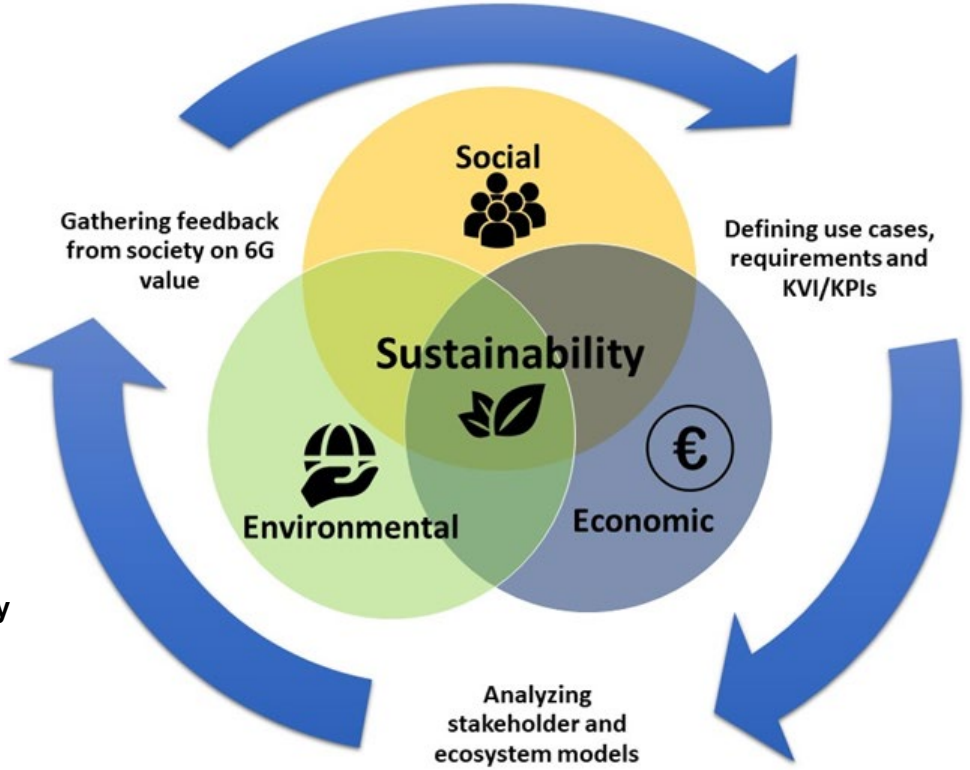
- Obtain **feedback on 6G value** addressing their needs and concerns

to define use cases and requirements

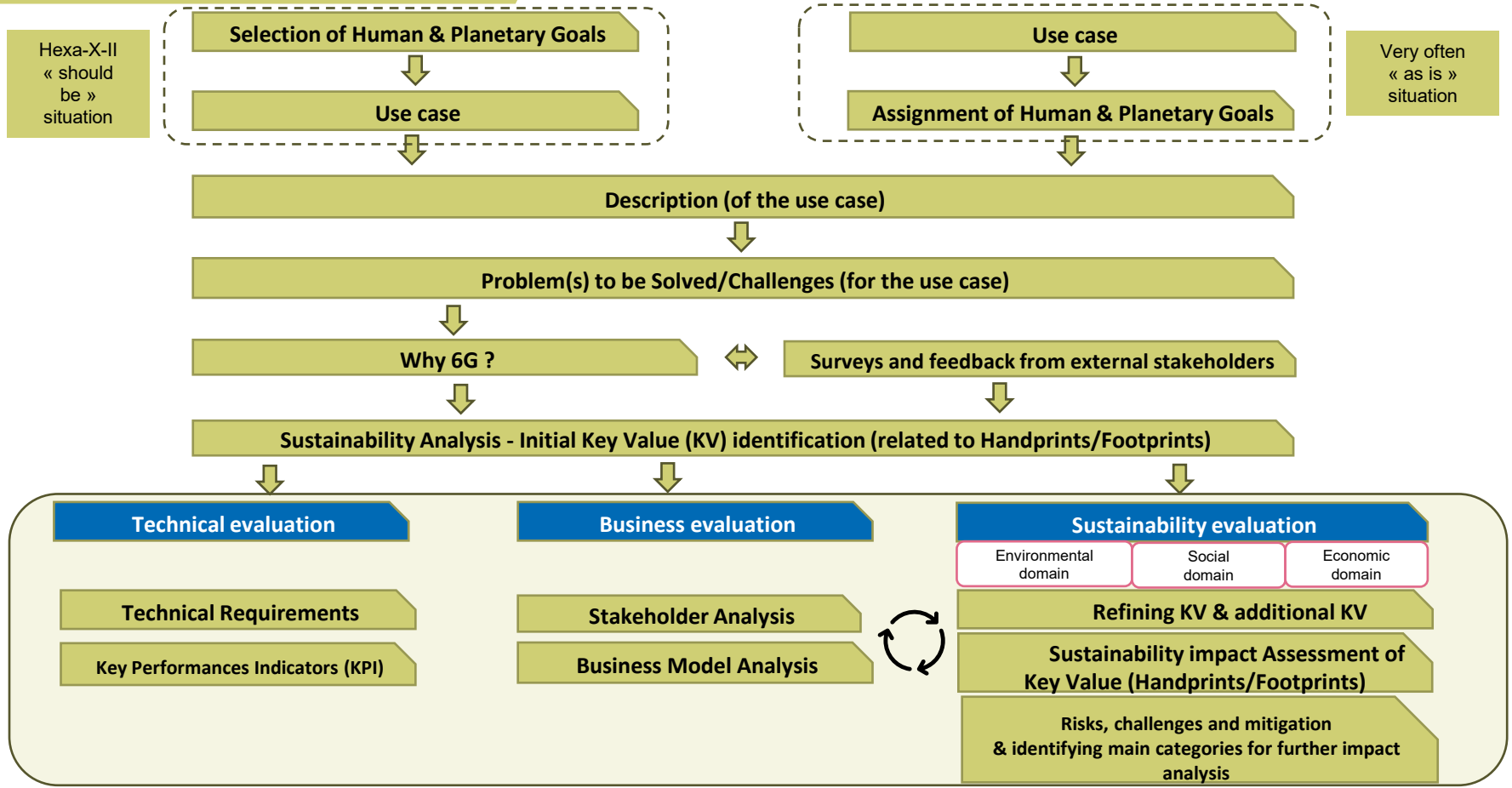
- Extract **requirements**, **Key Performance Indicators** and **Key Values and Indicators**

and analyse stakeholders & ecosystem models

- Identify key **stakeholders** and define **business and revenue models** and establish the **6G ecosystem**



Use Cases & Sustainability Analysis



SUSTAIN 6G

Thank you for your attention!