6G-VERSUS

6G Vertical trials for sustainability

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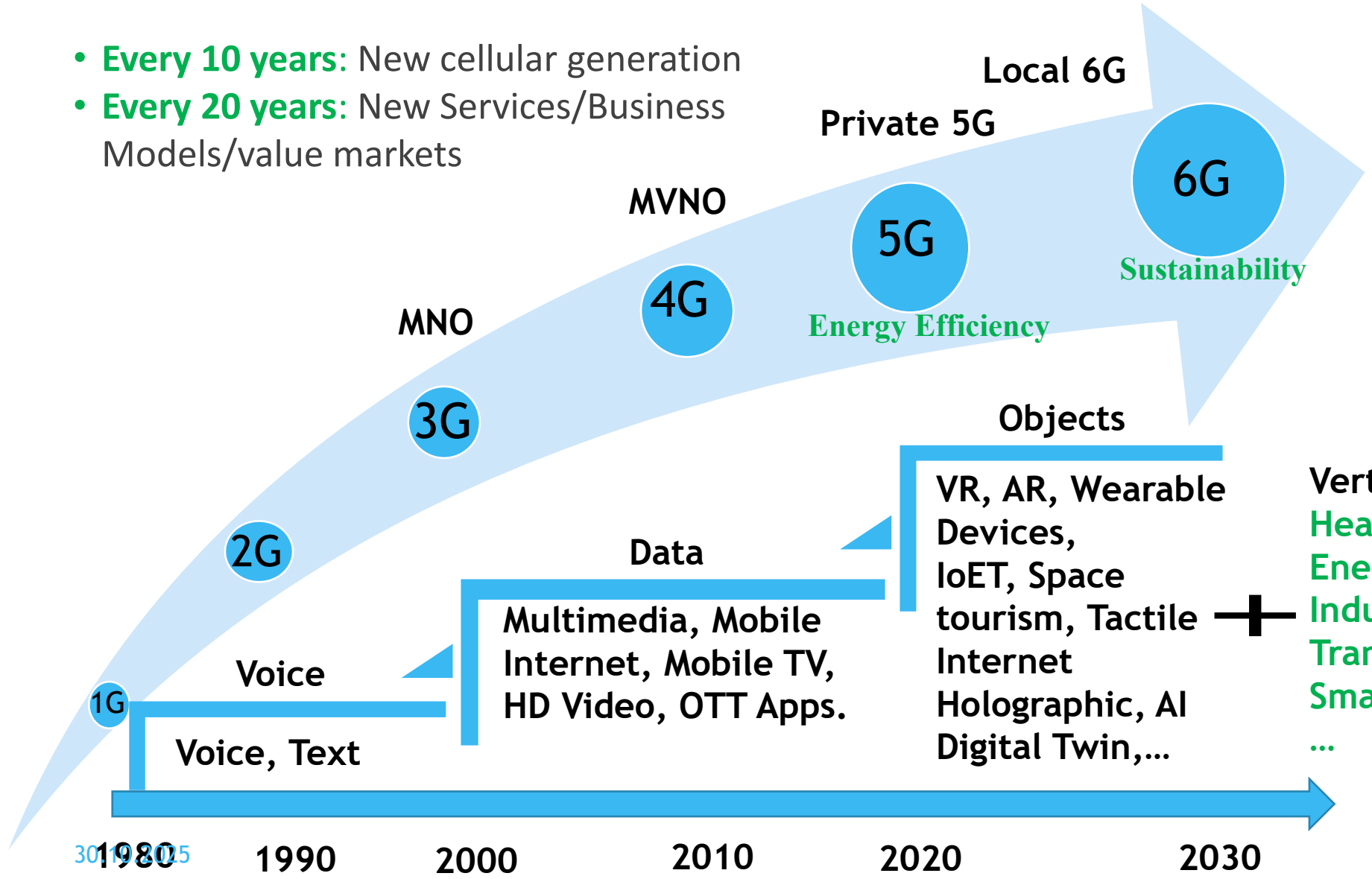
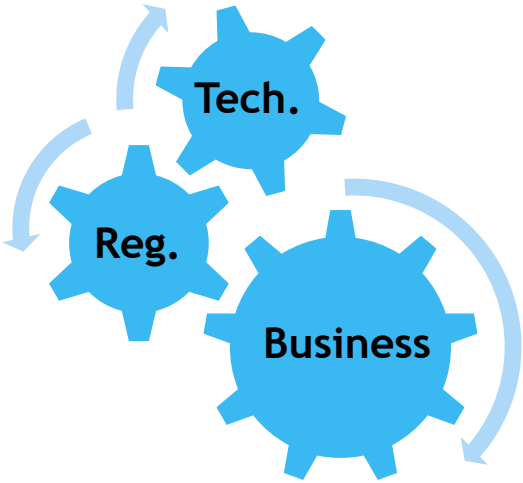
Evolution of Mobile Communications

- **Every 10 years**: New cellular generation
- **Every 20 years**: New Services/Business Models/value markets





Vertical-specific services
Health,
Energy,
Industry,
Transportation,
Smart agriculture
…

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6G, energy and sustainability

6G-VERSUS

6G provides a data-driven, hyper-connected world enabled by near-instant and unlimited wireless connectivity

6G energy efficiency and 6G for energy solutions

Technology enablers such as higher frequency bands, IoT, AI-powered network management and edge computing

6G enables verticals productivity, security, sustainability and new business models

6G introduction to market and the UN SDG both targeted for 2030

6G-VERSUS – Key Figures

- **Duration**: 36 months 1.1.2025 – 31.12.2027
- **Call**: HORIZON-JU-SNS-2024-STREAM-D-01-01 - SNS Large Scale Trials and Pilots (LST&Ps) with Verticals
- **Type of action**: HORIZON-JU-IA HORIZON JU Innovation Actions
- **Funding**: 12,1 M€, total budget 14,5 M€
- **Coordinator**: UOULU / Sanna Tuomela
- **Technical manager:** ICCS / Xenofon Vasilakos
- **Partners**: 34 from 10 countries: 13 academic and/or research organizations, 10 industrial partners, 9 SMEs and 2 NGOs

Partners

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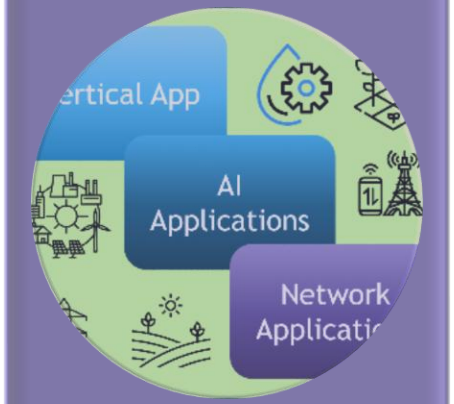
Objectives



Design and Development of a 6G-Enabled Application Framework for the triplet of V-app, AI-app and N-app

Conduct 6G Trials to Assess AI, Network and Application Performance, concentrating on the principles of "sustainable 6G"

Integrate Advanced 6G Applications across 6 6G-SNS and non-SNS Testbeds

Evaluate the societal and environmental impact of 6G trials to ensure alignment with sustainability goals and societal needs and create new business models

Maximize the impact and adoption of 6G-VERSUS results through dissemination, communication, capacity building, standardization efforts, and exploitation measures.

Sustainability

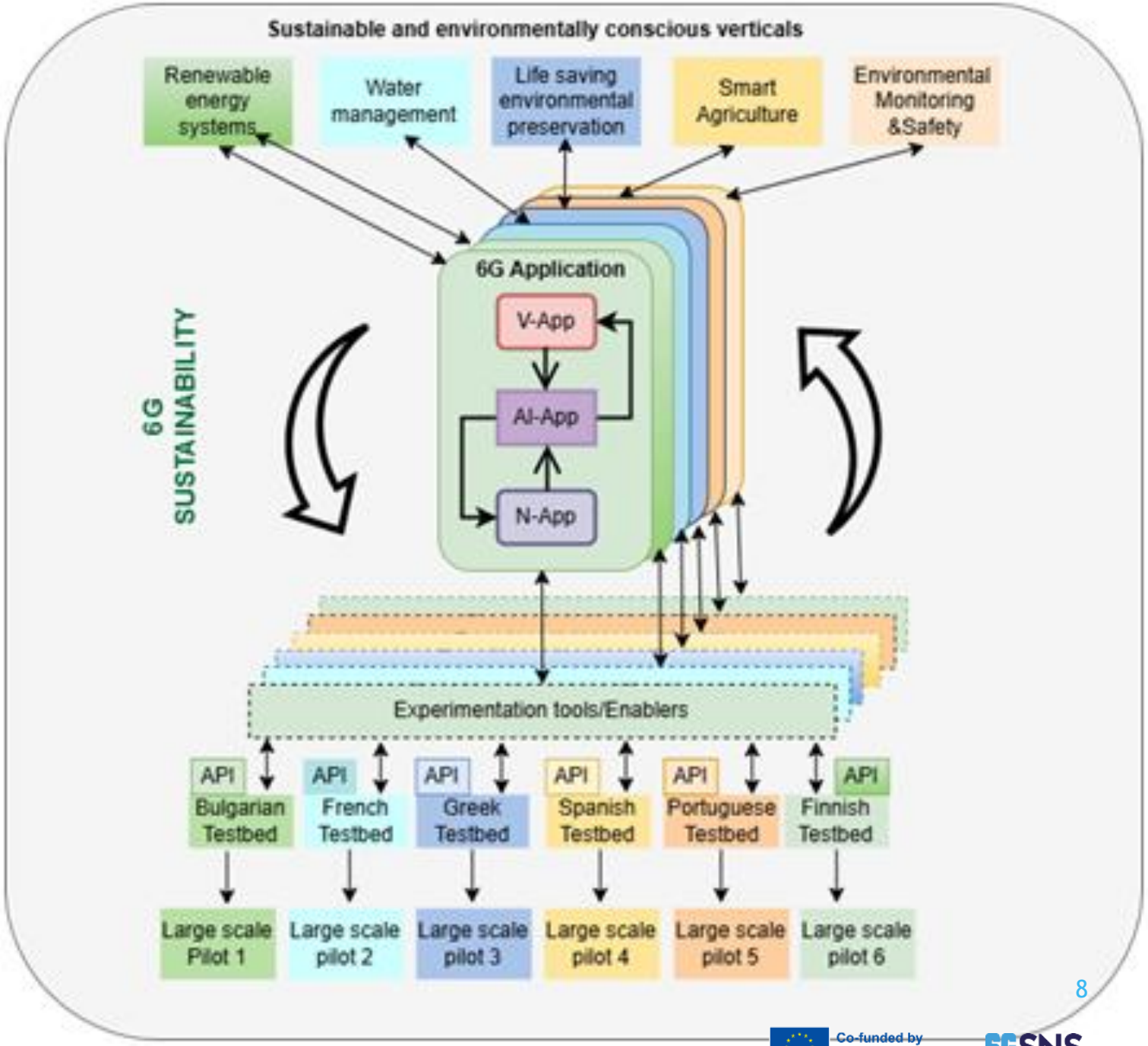
Expected impact

Scientific	• generate new knowledge and insights of the capabilities of 6G technology for verticals and for advancing sustainability.
Technical	• demonstrate 6G vertical solutions that enhance the performance, reliability, and sustainability of communication networks.
Economic	• empower businesses and vertical industries to leverage 6G technologies for sustainable and profitable growth.
Societal	• raise awareness of the societal benefits of 6G technology and inspire broader adoption and investment in sustainable telecommunications infrastructure.
Policy	• influence the development of policies and regulations that support the deployment of sustainable 6G technologies.

6G-VERSUS concept

The novelty lies in the transformation of a typical use case into a **6G Application**, i.e. a triplet of distributed but fully interacting software components that together realise an **AI-assisted vertical service**. Each 6G Application is composed of

- **Vertical App (V-App),**
- **Network App (N-App), and**
- **AI-assisted App (AI-App).**



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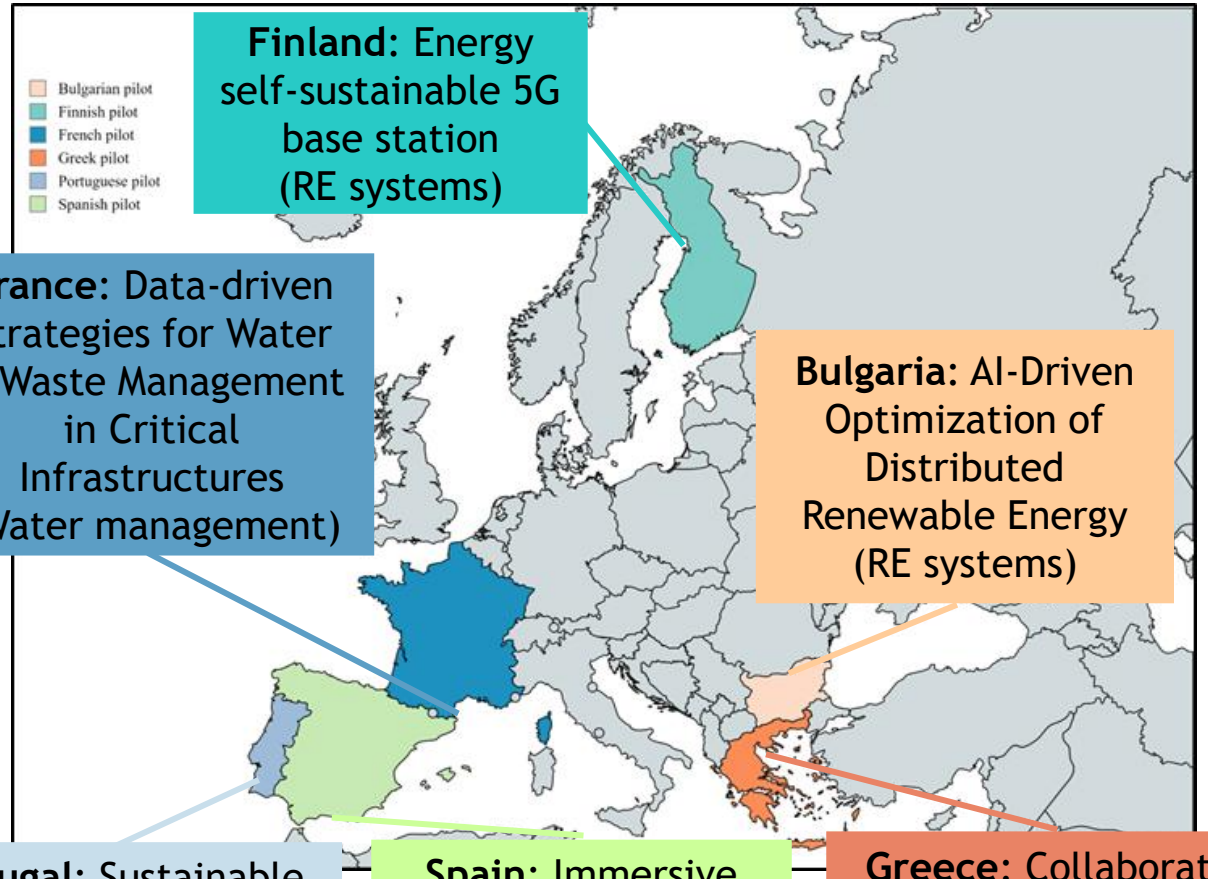
Pilot clusters



Finland: Energy self-sustainable 5G base station (RE systems)

France: Data-driven Strategies for Water & Waste Management in Critical Infrastructures (Water management)

Bulgaria: AI-Driven Optimization of Distributed Renewable Energy (RE systems)

Portugal: Sustainable & Safe Port Infrastructures (Environmental monitoring & safety)

Spain: Immersive Telepresence Actuator for Field Operations (Smart agriculture)

Greece: Collaborative Robotics for Search & Rescue (Life-saving environmental preservation)

- 6 large-scale E2E pilots for 5 verticals
- Real-life sustainability use cases
- Integration with 5G/6G testbeds
- Novel technology architecture and methodology

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Portuguese Cluster - Overview

- Improve environmental quality of the port of Aveiro

  (focus on water and air quality parameters)

- Safety levels in ports and their surroundings
- Enhance infrastructure energy consumption
- Use case trials will take place in Aveiro and Ílhavo

  (port of Aveiro as key end-user)

Portuguese Cluster - overview

IPN → Cluste Leader + Xapp provider

instituto de telecomunicações, altice labs → Testbed + xApp providers

ONESOURCE Consultoria Informática Lda., jsio IoT HASSLE FREE → XApp providers

Porto de Aveiro → End user

Aggregated map view of considered IoT data sources and their locations across the 3 scenarios

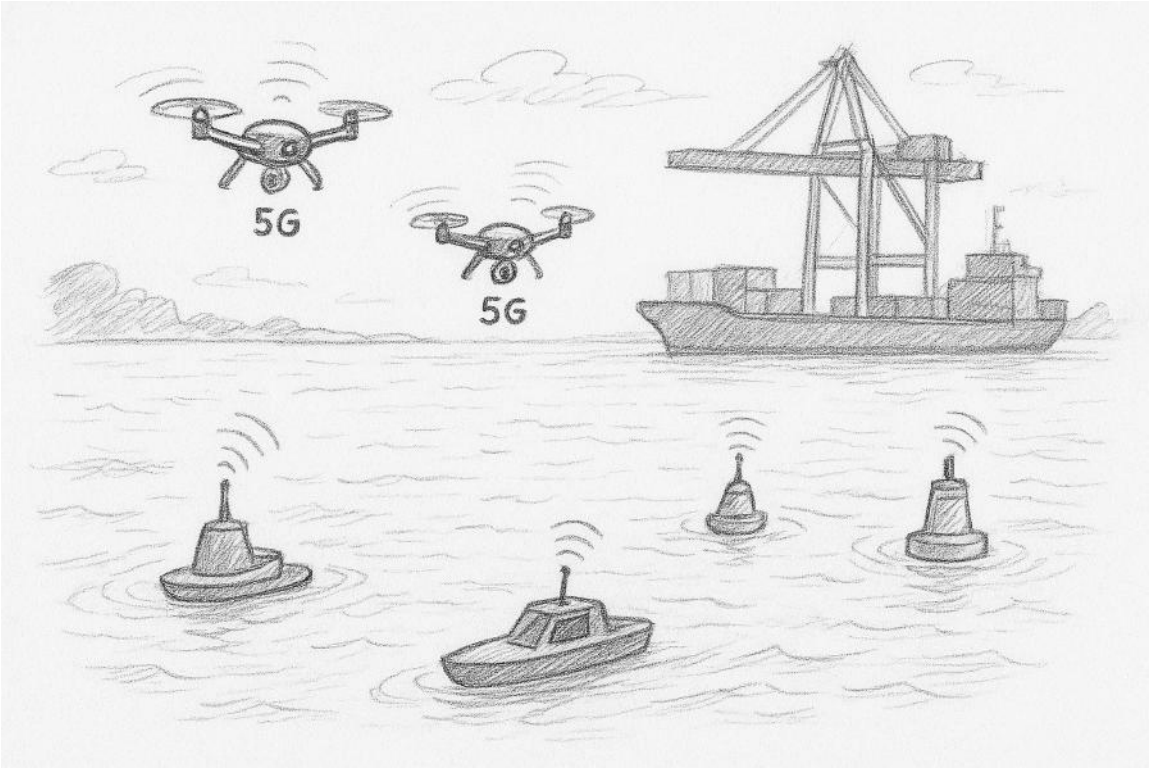
Portuguese Cluster – objectives & scenarios

- The cluster seeks to address **Sustainable Development Goals (SDG) targets and upcoming environmental regulations**, exploring B5G and 6G's potential to enable innovative and energy-efficient approaches for improved environmental quality and safety awareness in smart Port campuses.

- **Use case**: Monitoring capabilities for environmental quality and safety levels in ports, comprising 3 scenarios

S1: Port environmental awareness and enhancement

- B5G/6G for building **Port's environmental-centric replica** integrating real-time data, alerting and visualization capabilities for **monitoring, responding to, or anticipating environmental** issues within the Port.
- **5G NR RedCap** and zero-energy devices for environmental quality monitoring
- **Network APIs** for energy-efficient operation and dynamic configuration of devices
- **Energy-aware IoT communication scheduling** aimed at maximizing data transmissions efficiency
- Event-driven **on-demand activation of B5G-connected UAVs or RC boats** able to collect highly-rich data streams, providing additional important complementary context.

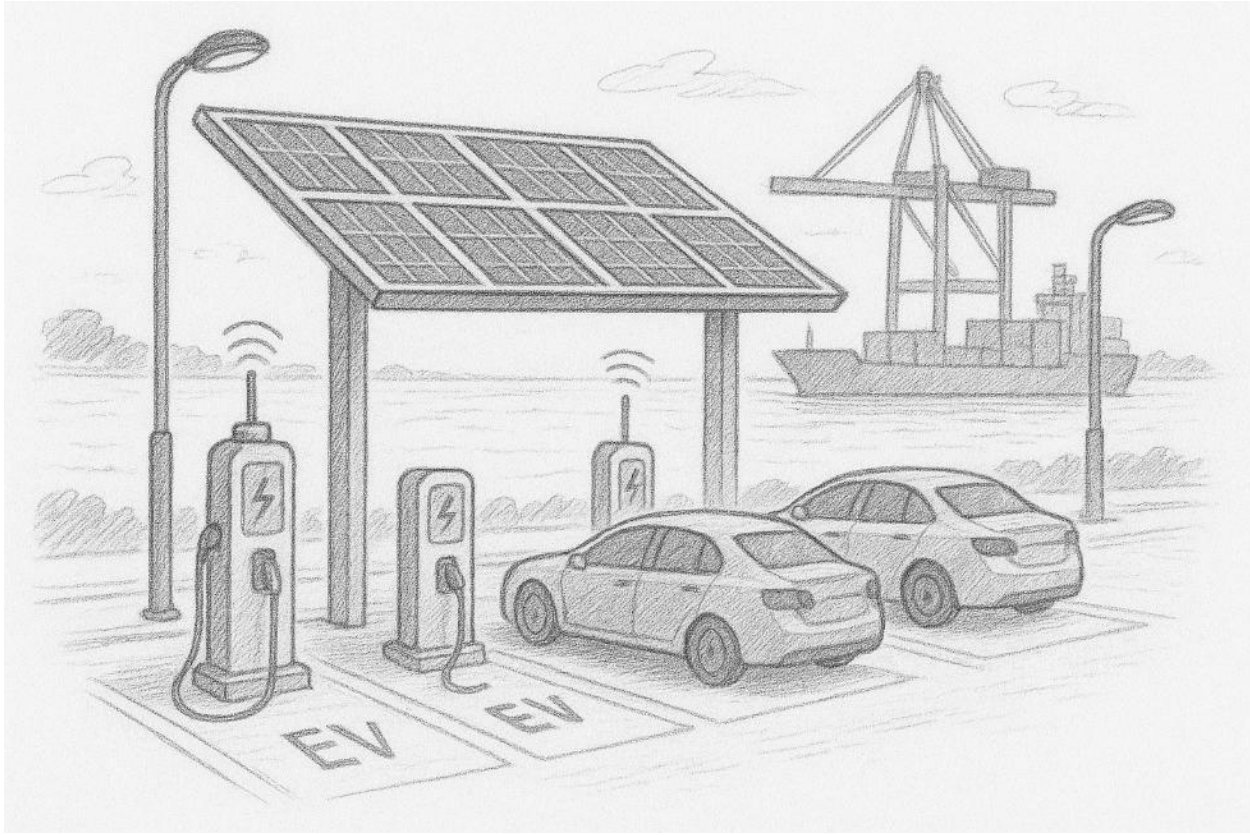


S2: Port safety awareness and enhancement

- **Dynamic orchestration** of network and compute resources to enable new port operational capabilities
- **Edge analytics** for vehicle-related data (e.g., plates, classification, distribution) gathered around the port
- **High-speed, low-latency connectivity** linking cameras and central processing units through integrated networking and computing
- **Intelligent resource management** to optimize energy, compute, and network usage using adaptive, low-resource data processing strategies
- Event-driven **on-demand activation of B5G-connected UAVs or RC boats** able to collect highly-rich data streams, providing additional important complementary context.

S3: Port infrastructure energy-awareness and enhancement

- **Leverages B5G/6G connectivity** to optimize energy consumption across buildings and smart street infrastructure, ensuring sustainable resource utilization.
- **Enhances EV charging efficiency** through dynamic power cutoff control, adapting in real time to energy demand and notifying vehicle owners accordingly.
- **Coordinates intelligent street lighting** within the testbed coverage area for improved energy efficiency and automated management.



Portuguese Cluster KVIs (Key Value Indicators)

KVIs

- Environmental Monitoring Coverage
- Energy Consumption (Smart Lighting)
- Proportion of Renewable Energy Use (EV Charging)
- Proportion of Renewable Energy Use (Smart Lighting)
- Environmental Incident Detection & Prevention
- Road safety incident Detection & Prevention
- Workforce Upskilling (Port Admin Staff)
- Stakeholder Engagement Activities

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Trials at Aveiro Port

- 6G-VERSUS, and specifically Portuguese trials, will demand the involvement of different societal stakeholders
  - National Ports
  - Environment organizations
  - Ports servisse providers & logistics companies
  - Smart infrastructure operators
  - **Local associations & group, citizens**

  - **Portuguese Trials @ Aveiro Port** starting **January 2026**

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