Safety and quality of life in the territory

The area of specialisation ***Safety and quality of life in the territory*** refers to the adoption of innovative models aimed at identifying application solutions for the development and overall management of urban/metropolitan areas and the territory in general, with particular attention to smart mobility of goods and people, energy systems, to the relationship between public administrations and citizens and to safety and security. This concept is extended to monitoring of the territory and prevention of critical or risk events, to the environment, critical infrastructures and great consideration is given to the IT security of data and their use, to production systems related to Industry 4.0, to industrial automation, to the bio economy, reuse techniques, and to applications related to the *space economy*.

From a social point of view, the goal is to promote an effective public-private collaboration, to allow the development of technological and application solutions able to improve the citizens' quality of life, to influence economic growth of the territories with particular attention to the environment and to increase the competitiveness of the territory in the national and European context.

The macro sector of specialisation, focusing on safety and quality of life in the territory, deals with the issue of people's well-being in relation to the environment that surrounds them (natural and/or man-made). The focus is also on the relationship between the effects and the operating conditions of human activities, both linked to the production of goods and services or of another nature, considering safety as an enabling requirement to improve citizens' living conditions.

SYNTHESIS FRAMEWORK

SAFETY AND QUALITY OF LIFE IN THE TERRITORY

R&D system specialisation level	Very High
Territorial needs	Coping with: • energy consumption continuous growth and the consequent environmental impact, climate change in progress, scarcity of natural resources, congestion and overcrowding of urban centres. • Develop a sustainable development strategy from an energy and environmental point of view, but also from a socio-economic one. • Tackle widespread situations of hydrogeological instability and natural disasters.
Strengths and competitiveness of the territory	• High use of Local Public Transport (LPT). • Tourist vocation. • Specialization in telecommunications, electronics and scientific research. • Skills diffusion (industrial and research) on the territory. • Consolidated supply chain of large, medium and small companies. • Consistency with the strategic agendas at EU and national level. • High design capacity at national and international level. • Availability of qualified personnel. • Market opportunities linked to the complexity of the territory that has elements of considerable environmental value that require innovative technological solutions for its management and protection.

Impact	The impact of the technological and industrial solutions connected to the area of specialization is very broad and affects the following sectors: • Education. • Environment and territory protection. • Agriculture. • Construction. • Social and health services. • Hospitality • Shipbuilding and port sector.
Territorial pervasiveness	Whole territory
Sub-sectors	**Smart Mobility** *People transport networks and info mobility.* • Interaction with the citizen (information diffusion and collection) • Supervision and decision support centres • Planning and management of public and private urban mobility • Management of public and private vehicular fleets • Technologies for transports safety and comfort • Controlled access areas management • *eMobility*

Freight transport networks

- Monitoring of transport flows
- Supervision centres, operational management of logistics, emergency management
- Management, automation, integration, safety, efficiency and development of logistics nodes (ports, airports and interports)
- Planning and management of intermodal transport

Evaluation of environmental and economic sustainability of the interventions

- Traffic correlation models - emissions and cost–benefit analysis

Energetic transition

- Energy from renewable and innovative sources, transport, storage, conversion and materials
- Technologies and materials for *Smart Grids*
- Innovative technologies and processes for the creation and development of energy communities
- Processes and technologies functional to the hydrogen supply chain

Environmental sustainability and circular economy

- Technologies and materials for environmental sustainability and historical and cultural heritage preservation
- Integrated water management

- Sustainable waste management
- Design and optimization of new materials (from biological resources or agro-food, industrial and post-consumer waste, metallic materials, semiconductors, quantum materials, metal-ceramic systems, materials for innovative cutting tools, surfactants, nanoparticles , polymer composites and nanocomposites, conductive pastes and inks etc., materials remains for optoelectronics, photonics, energy conversion and storage, catalysis, quantum and space technologies, etc.)
- Process efficiency and environmental sustainability (e.g., CO_2 reduction, valorisation of by-products and/or organic waste, etc.)

Factories for the future and Industrial Automation

- Development and integration of innovative devices and sensors with reference to the concept of *Industrial Internet of Things* (IoT)
- Innovative systems and applications for Factory 4.0
- Implementation of learning networks and *clustering* algorithms for diagnostics, maintenance and malfunctions monitoring
- Knowledge technologies and semantic analysis techniques for knowledge bases exploitation aimed at developing platforms related to automation, safety management, accident prevention and sustainable buildings design from environmental impact point of view.
- Industrial automation (control systems, CAD-CAM, hw/sw platforms, robotics, simulators, virtual reality and AI)
- Modelling and representation of knowledge related to the entire production and life cycle and of the products.

- Development of innovative services (in the after sales area) and related enabling technologies. Predictive maintenance systems (*Life Cycle Cost Analysis* and *Condition Based Maintenance*)
- Virtual, Augmented or mixed Reality technologies and advanced simulation systems for *training* and monitoring

Security and territory monitoring

- Integrated security systems and supervision centres for critical infrastructures safety (energy, transport, factories, urban areas), goods and people (*homeland security, law enforcement*)
- Innovative technologies and processes for environmental monitoring with particular attention to weather-hydrogeological risk and climate change
- Enabling technologies in the sector (*High performance computing, Big Data, IoT/Signal processing, Block chain, 5G/Data transmission, Safety, Security &Cyber, Digital Twin/Simulators, Risk analysis, Early detection,* Image processing, *Pattern recognition*, Innovative ways of using AI and EDGE AI for energy and pollution calculations)
- Innovative technologies and processes to support environmental requalification activities
- Monitoring and predictive maintenance of critical infrastructures by combining heterogeneous data
- PRIVACY & *Data Protection*

	Space Economy
	Upstream and Downstream
	• *Upstream* applications, with reference to telecommunications, satellite navigation, Earth observation (EO), automation and robotics
	• Specific d*ownstream* applications for various application areas