

ID53 RAISE PROJECT: SUSTAINABLE ENVIRONMENTAL CARING AND PROTECTION TECHNOLOGIES, TOWARDS A ZERO EMISSION ENVIRONMENT

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Abstract

The Italian RAISE project is committed to advancing innovation ecosystems in AI and robotics within the Liguria region. Spoke 3, in particular, concentrates on sustainable environmental technologies that combine advanced technologies, cost-efficient devices, AI, and active participation through citizen science. These integrated ecosystems align efforts to leverage local testing, strengthen capabilities, address challenges, and foster innovation driven by ethical design principles, aiming to deliver substantial economic and social benefits.

Keywords - Robotics, Artificial intelligence, Cost-effective devices, Intelligent Marine observing systems, Data management, FAIR principle

INTRODUCTION

RAISE (Robotics and Artificial Intelligence for Socio-economic Empowerment) is an Italian project funded by the Ministry of University and Research under the National Investment Recovery and Resilience Plan for the period 2022-2025, that is approaching the final phase. The project's objective is to establish and enhance innovation ecosystems rooted in the scientific and technological fields of artificial intelligence and robotics. These ecosystems are designed to align with the technological specialisations of the Ligurian region (Italy), fostering collaboration between research institutions, industry, and local organisations. Liguria's unique scientific, technological, and economic characteristics have served as an ideal testing ground for this initiative, which aims to leave a lasting impact both nationally and internationally.

The governance model of RAISE follows a Hub & Spoke structure and encompasses five thematic areas: Spoke 1) accessible and inclusive urban environments and services; Spoke 2) personal and remote healthcare; Spoke 3) environmental care and protection; Spoke 4) smart and sustainable ports; and Spoke 5) knowledge and technology transfer.

SUSTAINABLE ENVIRONMENTAL CARE AND PROTECTION

RAISE Spoke 3, titled "Sustainable Environmental Care and Protection Technologies Towards a Zero Emission Environment", seeks to build an innovation ecosystem to improve strategies and methods for environmental monitoring. By leveraging the capabilities of robotics and AI, Spoke 3 transforms the current approach to environmental monitoring, which, despite its advanced technology, often suffers from a lack of integration among monitoring systems. The primary objective is to address this issue by developing innovative robotic systems managed by AI, enabling a seamless blend of punctual and widespread monitoring. This enhances the efficiency of data collection, extends the duration of monitoring missions, saves energy, and improves the quality and timeliness of forecasting systems dedicated to safeguarding the aquatic, terrestrial, and aerial sectors of the territory. Spoke 3 includes specific vertical projects aimed at addressing distinct challenges through the development of innovative products. These projects

utilise advanced technologies, cost-effective devices, AI, and citizen science.

A key initiative under Spoke 3 is the development of advanced technology platforms for marine monitoring and forecasting. The aim is to design a comprehensive monitoring system that integrates point-specific and widespread capabilities, combining traditional in situ measurements with adaptive AI-driven solutions. The key efforts of the 12 products under development involve the integration of hardware and software, the development of new sensors and robotic technologies, and testing early warning systems for marine environments focusing on various parameters. Overall, the products are advancing towards their goals, with a continued focus on data collection, algorithm development, and system optimization for effective marine monitoring and forecasting. These products are contributing to a distributed spatiotemporal monitoring system powered by AI-guided robots, equipped with innovative sensors and adaptive strategies.

Another key project under Spoke 3 focuses on the development of technologically advanced citizen science systems. This initiative aims to create scientifically validated workflows for managing and processing data derived from participatory sources and actions. Technologies already in use for citizen science campaigns targeting critical environmental parameters relevant to environmental protection and monitoring in the context of the UN SDGs have been identified. Dedicated applications are also being developed as part of this project. By applying technology-supported activities to environmental monitoring, the project seeks to gather valuable scientific data while maximising community engagement. All data collected in the field is then used to identify stakeholders and effectively plan and promote citizen science campaigns.

The data produced within RAISE Spoke 3 are managed by the backend infrastructure that is fully compliant with European standards and the FAIR principle, improving its efficiency, accessibility and security. The interoperable environment will facilitate collaboration and data exchange with other platforms and services in the European context (e.g., EMODnet, Copernicus). The system also facilitates the dissemination of results to the scientific community, industrial associations, and citizens.

CONCLUSIONS

As the RAISE project approaches its conclusion, its innovation ecosystems are advancing environmental monitoring strategies. Progress in Spoke 3 highlights the potential of robotics and AI to tackle complex challenges, tailored to the Ligurian region's needs, with promise for broader applications. The project's data infrastructure, fully compliant with European standards and FAIR principles, strengthens RAISE's role in European data management. Interoperability with platforms like EMODnet and Copernicus fosters seamless collaboration and knowledge-sharing among stakeholders. By addressing critical environmental challenges and promoting community engagement, RAISE is emerging as a benchmark for innovation in AI, robotics, and environmental monitoring.