



Call for tender for the presentation of proposals for the Strengthening of research structures and creation of R&D "*innovation ecosystems*", set up of "*territorial leaders in R&D*" — to be funded under the National Recovery and Resilience Plan (NRRP), Mission 4, Component 2 Investment 1.4, funded from the European Union - NextGenerationEU.

Annex 1 - Project proposal (Article 10, paragraph 3 and Article 12 of the Call)





NAME OF THE INNOVATION ECOSYSTEM Tech4You - Technologies for climate change adaptation and quality of life improvement



TECH4YOU

The more you change, the less climate changes.

DURATION OF THE RESEARCH AND INNOVATION PROGRAM (months): 36

NAME OF THE PROPOSER: Università della Calabria

IMPLEMENTING BODY - HUB: Università della Calabria (Unical), Università degli Studi Magna Graecia di Catanzaro (Unicz), Università degli Studi Mediterranea di Reggio Calabria (Unirc), Università degli Studi della Basilicata (Unibas), Consiglio Nazionale delle Ricerche (CNR), Regione Calabria, Regione Basilicata, Agenzia Regionale per la Protezione dell'Ambiente della Calabria (ARPACAL), Agenzia Regionale per la Protezione dell'Ambiente della Calabria (Unipo e di Innovazione in Agricoltura (ALSIA), Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (CREA), Ente Parco Nazionale del Pollino, Ente Nazionale per il Microcredito (ENM), Forum del Terzo Settore, Distretto dell'Appennino Meridionale, Agenzia Calabria Verde, Ente Parco Nazionale dell'Aspromonte, Ente Parco Nazionale della Sila, Entopan Innovation SRL

Legal form: Consortium (Società Cooperativa a Responsabilità Limitata)

SPOKE AND AFFILIATED WITH THE SPOKE PERFORMING PARTIES:

- Spoke 1 Circular technologies to mitigate geo-hydrological and forest fire risks: CNR <u>Affiliates</u>: Unical, Unibas, Unirc
- Spoke 2 *Technologies to reduce energy consumption and save biodiversity*: Unical Affiliates: Unibas, Unirc, CNR, ARPACAL, Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), EIT Manufacturing SRL, RINA Consulting CSM SpA, Techfem SpA
- Spoke 3 Smart technologies for sustainable agri-food chain and forestry: Unirc <u>Affiliates</u>: Unical, Unibas, CNR, CREA, TIM
- Spoke 4 *Technologies for resilient and accessible cultural and natural heritage*: Unibas <u>Affiliates</u>: Unical, Unirc, CNR
- Spoke 5 *Technologies for healthy nutrition and resilient communities*: Unicz <u>Affiliates</u>: Unical, Biotecnomed Scarl, EPITECH Group SpA
- Spoke 6 Digital transformation and technology transfer: Unical Affiliates: Unibas, Unicz, Unirc, ENM, Engineering, NTT Data Italia SpA, Entopan Innovation SRL,

COST OF THE PROGRAM: € 137.851.720,50

NRRP THEMATIC AREA: CLIMATE, ENERGY, SUSTAINABLE MOBILITY

TERRITORY OF REFERENCE: Calabrian and Lucanian territorial areas



A) AREA OF SPECIALISATION / SCIENTIFIC AND TECHNOLOGICAL FOCUS

A.1) Connections with the scientific and economic vocations of the area of reference

Tech4You aims to boost the innovation potential of two of most of Italy's "less developed regions": Basilicata and Calabria, currently classified as "transition regions". To reach this goal, Tech4You focuses on those scientific and technological areas that, better than others, represent the intersection between the needs of the territories and the scientific skills available in the local research centres, that are: the climate change adaptation/mitigation and the improvement of the quality of life. Calabria and Basilicata are, in fact, naturally vocated to be ideal places for the well being of both citizens and tourists since they have a unique natural environment with four national parks and a very long coastline, a mild climate, hundreds of nice rural villages, characteristic traditional food, important local agricultural productions and a relevant cultural heritage. Unfortunately, this huge potential is still largely unexpressed and it is also exposed to several risks, also due to the effect and the impact of climate change. In 2021, the Regional Innovation Scoreboard places Calabria and Basilicata as less developed regions, respectively in third and fourth last positions among the Italian regions, confirming structural weaknesses that hinder their main development levers. Tech4You wants to face this challenge by creating an innovation ecosystem in which the scientific research made by the local universities and research centres meets the need of the citizens and the public bodies to be transferred in marketable products developed and exploited by local companies with the support of experienced players from the industrial innovation sector

The socio economic context in Calabria and Basilicata

In 2019, the regional Gross Domestic Product (GDP) (in Calabria, 33.26 million euros and Basilicata 12.57 million euros) contributed less than 2% to the national GDP (Eurostat, 2020). Moreover, the economic inequality of salaries are below the Italian (29700 euros) and European (31000 euros) averages (Eurostat, 2020). The public sector accounts for a significant share of regional employment (Calabria about 25% highest among Italian regions). In general, it is difficult for the regional enterprises to position themselves in a national/international competitive scenario.

Region	Resident population (M)	GDP GD (EUR, M)	GDP per capita (EUR, k)	Active enterprises (k)	Unemployment rate (%)	Added value /worker(k)	
Calabria	1.95	33.26	17.0	187.11	21.0	29.1	
Basilicata	0.56	12.57	21.9	60.49	10.8	37.5	

The difficulties in consolidating a socio-economic model also based on research and innovation in Calabria and Basilicata are linked to a modest R&D expenditure as a percentage of GDP (0.54% in Calabria; 0.67% in Basilicata vs 0.96 in Southern and 1.47% in Italy – Istat, 2019) and the ratio of R&D workers to population lower than the average for Southern Italy.

The regional research system, showing scientific excellence in the ecosystem targeted topics, includes three public universities in Calabria (Unical in Rende (CS), Unicz in Catanzaro, Unirc in Reggio Calabria) and one in Basilicata (Unibas in Potenza and Matera). The four academic bodies involve over 2.000 researchers, 77 spin-offs and 132 registered patents. The scientific system is strengthened by the network of institutes of the CNR and the CREA.

Thanks to the regional universities, in Calabria, the number of science and technology graduates has grown substantially, from 3-4% in the early 2000s to 10% in the latest survey. The creation of spin-offs and innovative start-ups, supported by university and scientific research activities, is also one of the main factors explaining a structural change in an economy. The economic geographical context shows 395 innovative startups (260 in Calabria, 135 in Basilicata, 2021) and 80 spin-offs (research companies, 65 in Calabria and 15 in Basilicata, 2021). In Basilicata, the highest number is in Potenza (absolute value 102, average annual growth 15), in Calabria the highest number is in Cosenza (absolute value 95, average annual growth 14).

The future challenges

In recent years it has been observed an increase in extreme events related to climate change whose effects are directly proportional to the vulnerability of the territory. In particular, Basilicata and Calabria are two of the regions most exposed to hydrogeological risk, coastal erosion and, in some areas, desertification.

For this reason, recently, regional research and business sectors are showing an interest in the topic of climate change adaptation and ecological transition. Worldwide investments in **climate technology** is an emerging



asset class, with H1 2021 providing record levels of investment over **60 billion** (210% increase from \$28.4 billion invested in the previous 12 months). In this context (H2, 2020 + H1 2021), the United States is the dominant geographic region in climate technology investment (\$56.6 billion), followed by Europe (\$18.3 billion) and China (\$9 billion) (The State of Climate Tech, 2020).

The transition to a fully circular economy, on the way to be adaptive to climate change and risks issues, poses a growing need for companies to invest in data science to prevent and simulate self-consumption and energy generation from renewable sources, energy efficiency, in line with global and European New Green Deal strategies, with the focus on managing environmental risks (very high hydrogeological risk, lack of water, progressive desertification, systematic failure to take care of the natural heritage in the past, etc).

Tech4You thematic priorities

In line with the "CLIMATE, ENERGY, MOBILITY" specialisation area, Tech4You priority themes are linked to the scientific vocations and operational areas of the associated research organisations. In particular:

- mitigation of natural hazards, through research strands in line with the scientific competencies of the research groups, to increase the safety of the territory, as well as flood risk prevention and improve environmental management in which operate CNR, as well as the departments of Unical, Unibas and Unirc. 14 start-ups and 8 spin-offs are active in this field at the university level and from 2015 to 2020 there were 3712 new graduates;
- 2. reduction of energy needs and decarbonisation, in a manner consistent with the research strands, presided over by Unical departments and those of the partner universities, particularly in the areas of research specialising in smart grid, new renewable energy sources, in the protection, enhancement of the marine system and safeguarding biodiversity, in waste management and processing with lower energy consumption and CO₂ emissions, and the transition to eco-mobility management in urban/suburban areas; 55 start-ups and 18 spinoffs are active in this field at university level and from 2015 to 2020 there were 1249 new graduates (Calabria and Basilicata);
- 3. improving food, forestry and bio-economy sustainability, by deploying Unirc's framework of expertise and research specialisations on agriculture, forestry and food, and UNIBAS on water management; 38 start-ups and 3 spinoffs are active in this field at the university level and from 2015 to 2020 there were 818 new graduates (Calabria and Basilicata);
- 4. adaptation and accessibility of cultural heritage: to monitor and mitigate the impact of extreme meteorological events and other natural risks on built cultural heritage and natural heritage while improving also the accessibility for all through new technologies developed within the research activities of Unibas on cultural issues and Unical specialisation on technologies for protection and dissemination; 20 start-ups and 4 spinoffs are active in this field at university level and from 2015 to 2020 there were 2079 new graduates (Calabria and Basilicata);
- 5. resilient and healthy communities: through the development of tools for monitoring health status and nutraceuticals or digital aids to support therapeutic activities. Unicz departments specialised in human health studies and clinical prophylaxis have been operating for a long time in this area of research; 51 start-ups and 11 spinoffs are active in this field at the university level and from 2015 to 2020 there were 7902 new graduates (Calabria and Basilicata).

Critical issues related to adaptation and risk mitigation are the drivers to guide a research proposal focused on the peculiarities and areas of change in Calabria and Basilicata. The focus of the ecosystem is on the Mission "Adapting to climate change" of Horizon Europe and is consistent with the priorities of the national research NRP and the areas of the NRRP. Tech4you, due to its transversal nature, contributes to the approaches of the NRP areas "4. Digital, Industry and Space", and "5. Climate, Energy and Mobility", and "6. Food, Bioeconomy Natural Resources.

A.2) Connections with regional operational plans and supra-regional research and innovation priorities (Smart Specialisation Strategy)

Tech4You's research and innovation programme, through a systemic approach structured in 6 Spokes that operate in an integrated manner, contributes, through the work packages of reference for each Spoke, to the achievement of the diverse objectives in the context of territorial, national and EU policies of reference. Tech4You research themes are strictly coherent with the objectives. The strategies have operational and synergic deployment within the policy framework.



The following table shows the connections between the NRP intervention area "Climate, energy, mobility", chosen as a priority by the Ecosystem, and the individual Spokes, concerning:

- the elements characterising the strategic approach "Climate, energy, mobility" related to the research and innovation activities of Tech4You (mitigation of natural hazards, reduction of energy needs and decarbonisation, green technologies, bio-industry for the bio-economy, knowledge and sustainable management of agricultural and forestry systems, knowledge, technological innovation and sustainable management of marine ecosystems, etc.);
- the connection with the Mission "Adapting to climate change" of Horizon Europe;
- the connections with the further areas of specialisation of the NRP, which have links, synergies, complementarity with the specific objectives of the ecosystem spokes ("6. Food, bio-economy, natural resources, agriculture, environment" and "4. Digital, Industry, Aerospace");
- the framework of the specific objectives of the Partnership Agreement, for Cohesion Policy Programming 2021 2027;
- the framework of specific objectives of the Regional Operational Programming documents 2021-2027, currently in draft form;
- the framework of priorities and intervention trajectories of the Regional Smart Specialisation Strategy (RIS3), to update it as an enabling condition for cohesion policies.

The framework portrays the strategic vision of a fully integrated ecosystem at the local level, the focus of innovation policies, which enhances the human and academic capital from the universities and research centres of Calabria and Basilicata.

	Horizon Europe Program	PNRR Mission	PNR area of specialisation	PNR sub-areas of research and innovation	Specific objectives of the Partnership Agreement 21-27	Specific objectives ROP 21-27	S3 Priorities
Spoke 1 - Circular technologies to mitigate geo- hydrological and forest fire risks		M2C4: Protection of land and water resources	Green technologies Knowledge and sustainable management of agricultural and forestry systems	Security for social systems Climate, energy, sustainable mobility	1.1 Research and innovation 2.4 Climate and risks 2.5-2.6 Water resources, waste management and circular economy	1.1 Developing and strengthening research and innovation capabilities and the introduction of advanced technologies 2.4 Promote climate change adaptation and disaster risk prevention and resilience, taking into account ecosystem-based approaches 2.6 Promote the transition to a circular economy	Environment, circular economy and biodiversity
Spoke 2 - Technologies to reduce energy consumption and save biodiversity		M2C2: Renewable energy, hydrogen, network and sustainable mobility M2C3: Energy efficiency and requalification of buildings M2C4: Protection of land and water resources	Green technologies Bio-industry for the bio- economy Knowledge and sustainable management of agricultural and forestry systems	Climate, energy, sustainable mobility	1.1 Research and innovation 1.3 Growth and competitiveness of SMEs 2.1-2.2-2.3 Energy 2.5-2.6 Water resources, waste management and circular economy 2.7 Biodiversity and pollution	1.1 Developing and strengthening research and innovation capabilities and the introduction of advanced technologies 1.3 Strengthening the sustainable growth and competitiveness of SMEs2.1 Promoting energy efficiency and reducing greenhouse gas emissions 2.2 Promoting renewable energies 2.6 Promote the transition to a circular economy 2.7 Strengthen biodiversity, green infrastructure in the urban environment and reduce pollution	Eco-sustainable building, energy and climate
Spoke 3 - Smart technologies for sustainable agri- food chain and forestry	o climate change"	M2C1: Circular economy and sustainable agriculture	Food science and technology Knowledge and sustainable management of agricultural and forestry systems	Food products, bioeconomy, natural resources, agriculture, environment	1.1 Research and innovation 1.3 Growth and competitiveness of SMEs 1.4 Skills for Industrial Transition 2.5-2.6 Water resources, waste management and circular economy	 Developing and strengthening research and innovation capabilities and the introduction of advanced technologies 3 Strengthening the sustainable growth and competitiveness of SMEs 1.4 Developing skills for smart specialization, industrial transition, and entrepreneurship 2.6 Promote the transition to a circular economy 	Agriculture 4.0 and agri-food
Spoke 4 - Technologies for resilient and accessible cultural and natural heritage	 Mission "Adapting to 	M2C1: Circular economy and sustainable agriculture M1C3: Tourism and Culture 4.0	Green technologies Bio-industry for the bio- ecconomy Knowledge and sustainable management of agricultural and forestry systems Knowledge, technological innovation and sustainable management of marine eccosystems	Security for social systems Humanistic culture, creativity, social transformation, inclusive society	1.1 Research and innovation 1.4 Skills for Industrial Transition 2.5-2.6 Water resources, waste management and circular economy 2.7 Biodiversity and pollution 4.6 Cultura e turismo	1.1 Developing and strengthening research and innovation capabilities and the introduction of advanced technologies 1.4 Developing skills for smart specialization, industrial transition, and entrepreneurship 2.6 Promote the transition to a circular economy 2.7 Strengthen biodiversity, green infrastructure in the urban environment and reduce pollution 4.6 Rafforzare il ruolo della cultura e del turismo sostenibile nello sviluppo economico, nell'inclusione sociale e nell'innovazione sociale	Environment, circular economy; and biodiversity; tourism and culture
Spoke 5 - Technologies for healthy nutrition and resilient communities		M2C1: Circular economy and sustainable agriculture	Bio-industry for the bio- economy Food science and technology	Health Food products, bioeconomy, natural resources, agriculture, environment	1.1 Research and innovation 1.3 Growth and competitiveness of SMEs 1.4 Skills for Industrial Transition	 Developing and strengthening research and innovation capabilities and the introduction of advanced technologies Strengthening the sustainable growth and competitiveness of SMEs Developing skills for smart specialization, industrial transition, and entrepreneurship 	Life sciences
Spoke 6 - Digital transformation and technology transfer		M1C1: Digitalization, Innovation and Security in the Public Administration M1C2: Digitalization, Innovation and Competitiveness in the productive system M4C2: From research to enterprise	Transversal function to support the transition	Digital, industry, aerospace	1.1 Research and innovation 1.2 Digitalisation 1.3 Growth and competitiveness of SMEs 1.4 Skills for Industrial Transition	 Developing and strengthening research and innovation capabilities and the introduction of advanced technologies Enable citizens, businesses, research organizations and public administrations to reap the benefits of digitalization Strengthening the sustainable growth and competitiveness of SMEs Developing skills for smart specialization, industrial transition, and entrepreneurship 	ICT, digital technologies and innovative service sector

Tech4You promotes the production of research output through start-up activities, open innovation, technology and research results transfer, business and service acceleration.

The choice of the areas of specialisation is the driver to sustain the ecological, energetic and digital transition of the two regions, supporting the specific characteristics of the region and testing innovations to deploy a zero impact economy, in the logic of renewable exploitation of natural resources, boosted by the bio-economy and the environmental protection and enhancement.



Tech4You's organisational and strategic approach is fully consistent with the policy framework being defined and contributes to the regional development objectives of:

- reducing the R&D gap with other regions by promoting research, in a manner consistent with new production models based on circular economy and the bio-economy;
- supporting new innovative and technological enterprises and development of existing ones;
- training human capital for new challenges.

The Tech4You model leverages the prospective strengthening of the regional innovation system, working to research institutions, companies and the social context. The strategic vision is to support the emergence and consolidation of new services, technologies and solutions, through matching opportunities between needs and talents, between corporations operating in the region and innovative SMEs and start-ups from research centres.

A.3) Enhancement and setting up of existing initiatives and corrective measures to avoid duplication and overlapping

Tech4You action programme is part of a framework of policies regarding the two regions involved: every partner of the ecosystem participates in various programming and implementation phases, and by being part of a network of relationships with regional and supra-regional public and private actors. In Calabria, the programme makes it possible to exploit the STAR, SILA and IRPAC research infrastructures financed by national funds:

- STAR research infrastructure (Southern Europe Thomson Backscattering Source for Applied Research, a Research Infrastructure for Material Science), an innovative X-ray source for the study of matter, is included among the strategic national infrastructures;
- SILA (Integrated System of Laboratories for the Environment in Calabria) is an integrated system of laboratories and research infrastructures for the provision of services dedicated to the monitoring, control and protection of the environment;
- IRPAC is a technological and research infrastructure for the study of the human past and the conservation and management of cultural heritage.

The programme is synergically integrated with the "Innovation Poles", promoted by the Calabria Region and Clusters created in the framework of RIS3 in Basilicata to stimulate the demand for innovation by businesses; sharing research equipment and laboratories; providing specialised services; encouraging access by businesses to scientific and technological knowledge; training and qualification. Specifically, the Tech4You themes are closely linked to the Clusters:

- Biotecnomed: cluster for research and development in biotechnology and life sciences;
- Green HoME: cluster for the development of innovation projects and specialised services for sustainable construction;
- NET-NaturaEnergiaTerritorio: a network of cooperation between companies and universities/research centres for the promotion of research and innovation projects on the theme of ENVIRONMENT and NATURAL RISKS;
- Cassiodoro: network between enterprises and research organisations working to implement innovative activities in the field of culture and tourism.
- Lucanian Cluster of Bioeconomy: recently created in Basilicata in the framework of RIS3, in particular for the issues of water resource management;
- Cluster Energia Basilicata, created to bring together economic actors operating in the Basilicata energy sector. Companies, universities, research centres and public and private organisations;
- Cluster Lucano dell'Aerospazio, created to bring together economic actors and research centres, operating in the Basilicata in the field of earth observation and industrial development, in line with the S3 Basilicata;
- Cluster Tecnologico Nazionale (CTN) Energia (to which UNICAL is associated), whose technological domain is that of Source-Utilization energy processes, promotes actions aimed at supporting research, development and technology transfer in the Energy Specialization Area.

Other relevant initiatives are:

• the European project ESSENTIALS - Experiences of Social and Solidarity Economy: Networks of Incubators as Territorial development Strategies (Grant Agreement No. 101031632) funded under the H2020-MSCA-IF-2020 programme, implemented by Unical.



- the Open Incubator project, funded under the CIS Institutional Development Contract "Cosenza" for the creation of a "cultural hub", managed by Unicaland aimed at providing services for the promotion and incubation of tourism and cultural enterprises.
- numerous research projects on H2020, NOP, and ROPs, promoted by the Departments and laboratories of the promoters, which are the starting point for the development of many of the technologies adopted by the spoke and on which industrial validations will be promoted.

The participation of the promoters of the Ecosystem as proposers, implementers or partners of the various initiatives mentioned ensures continuity and strategic and operational integration, avoiding overlaps or duplications. They also participate directly and actively in the bodies that guide, coordinate and monitor research and innovation programmes and instruments (committees, RIS technology platforms, etc.).



B) OBJECTIVES AND SCIENTIFIC QUALITY

Finanziato

dall'Unione europea

NextGenerationEU

B.1) Activity planned, methodology, characteristics, objectives, the relevance of the research and innovation program

Tech4YOU, Research and Innovation Programme (R&I), proposes a synergic action between 4 public universities, 9 research centres, 9 private players (affiliated companies), 10 public authorities (natural parks and environmental agencies), 1 NGO, and 2 regional governments in Southern Italy.

Inspired by "Adaptation to Climate Change" (Horizon Europe mission), the programme aims to develop technologies for adaptation to the climate crisis by enhancing the resilience of communities and reducing the economic gap (vision).

Thech4You main concept is "*climate affects you*" and "*you act on the climate*" towards a sustainable and competitive Europe. Our R&I programme will enhance the scientific expertise of researchers and bring R&D results into use to build a resilient community and to strengthen SME competitiveness reducing the gap between research, market, and society.

The effects of climate change require a multi-stakeholder involvement (research, businesses, society and government) in a joint action towards resilient communities. The scientific data show the global impact of climate change: Southern and central Europe are seeing more frequent heat waves, forest fires, floods and drought. On the other hand, Northern Europe is getting significantly wetter, and winter floods could become common. Climate change, variations in land use and anthropogenic pressure have caused land degradation and desertification phenomena rather significant in the Mediterranean countries, and Mediterranean Basin is becoming drier, making it even more vulnerable to drought and wildfires. Many languages narrate the ongoing crisis, from "Uggianaqtuq" (Innuit of the Arctic), "Koyaanisqatsi" (Hopi Indian) to "climate breakdown" (industrial countries). All converge towards a unique meaning "loss of the state of friendship between humans and nature" that can generate emotional distress and reduce the quality of life. The transformation of the territory passes through a process of technological and cultural transition, in which the emotional discomfort and emotional distress of the community (solastalgia) need more sustainable lifestyles.

Tech4You recognises both the urgency and the last chance to take an action. Everyone keeps forgetting that climate change is the problem, reacting with a combination of fear, apathy and denial since causes appear very distant from the effect. People (30% of Calabrian and (36% of Lucanians) believe climate change is irreversible. Tech4You will inspire a new generation of researchers showing that using knowledge to develop innovative solutions is the response to the "last call" for a green transition towards a sustainable, inclusive and fair future.

Objectives

Tech4You will address climate change from 5 perspectives: natural risk, energy, food, culture, and healthy communities talking about the specific objectives (SO) described below:

- SO1 **Mitigation natural risk**: Tech4You aims to mitigate the impact of climate change on increasing the natural risk (hydrogeological, hydraulic, coastal erosion, droughts and fires) through the integration of satellite technologies, the development of early warning technologies, management of critical infrastructure, testing of Nature-Based Solutions and improvement of water quality (Spoke1); it impacts on the safety of the population and particularly for the people living in rural areas or in small villages that often are critically exposed to natural risks.
- SO2 **Reduction energy needs**: Tech4You aims to increase the decarbonization of the energy system through reuse and recycling of waste or secondary raw materials (Spoke2); it aims to improve the quality of the air and the natural environment while reducing the cost of the families' energy supply;
- SO3 Improvement of sustainable foods: Tech4You aims to improve the sustainability of the agrifood system through the development of technologies for smart farming, sustainable models for the agrifood industry and the valorization of waste (Spoke3); it contributes to providing healthier food and better working conditions for the agricultural workers
- SO4 Adaptation of cultural heritage: Tech4You aims to mitigate the impact of extreme weather events on cultural heritage and to improve the accessibility for all leveraging on digital technologies (i.e.: robots, sensors, artificial intelligence, big data and augmented reality) (Spoke4); it wants to reinforce the local identity leveraging on the enhancement of the tangible and intangible cultural heritage and, on the other side, wants to enable the accessibility for all without any restriction for older people or disabled;
- SO5 **Resilient and healthy communities**: Tech4You aims to build resilient communities to promote the well-being of citizens, through the development of tools for monitoring health status and new healthy



products (nutraceuticals, cosmetics and wearable devices) with therapeutic effects (Spoke5); it is the one most focused on the improvement of the quality of life by promoting new approaches, models and technologies that will directly impact of the daily life of the citizens

Activities planned

Tech4You activities are detailed in the following sections: in section C2 all the activities implemented at the Hub level and in section C4 all the activities at the spokes level. The Hub will coordinate all the spokes and will lead all the cross actions related to communication, public engagement, capacity building, also stimulating those activities in each spoke. The spokes 1-5 will be focused on the implementation of the research and innovation activities that are all addressed to bring the most promising technologies already developed by the research organizations to a higher TRL as close as possible to a marketable stage so that they could be quickly transferred to companies for being industrialized and commercialized. R&I activities will be strongly addressed to have pilot demonstration projects in which the involvement of the final users will be fundamental for the validation. The use of cascade funding will be also very important to expand the ecosystem by including a wide range of companies (particularly the many start-ups and spin-offs that are interested in the Tech4You topics). All the spokes will implement a relevant quote of the budget (as described in section C4) for the cascade funding for the SMEs.

Methodology to be used for the implementation

The program has the triple goal of i) to bring into use new scientific breakthroughs, ii) to reduce notemployment (also increase female in STEM and management process), and iii) to strengthen company competitiveness by transferring to them emerging technologies from academia. Starting from technologies validated in a lab or relevant environment (TRL 4/5), the program will increase their maturity level moving it out of the lab to validate and demonstrate the impact in the operational environment (TRL7) and to reach a system complete and qualified (TRL 8) by using pilot sites and communities engaged in both regions. The research activities are divided into 6 spokes (5 thematic and 1 cross-cutting (Digital transformation and Technology Transfer). Each spoke has a specific mission, aligned with the vision of the overall programme. To reach the vision, the specific activities are planned in 31 organizational goals, 55 pilot projects, with a critical mass of 1017 researchers, 163 new employees (researchers and technologists), 113 industrial PhD courses and a total budget of \notin 137.851.720,50 in 36 months. Tech4You will use a flexible approach focusing on value creation using 4 implementation phases (exploration, initial implementation, full implementation and sustainability). A Knowledge Management System will monitor the technology's maturation and prepare for use (exploitation) during the whole program development to be able to maximise impact at the end of Tech4You. Involvement of communities (Public Engagement), bridging research to use and businesses (Technology Transfer), and upgrading competencies (Training Actions) will stimulate the development and consolidation of innovation ecosystems (Researchers, Intermediary Organisations, Enterprises, Policy Makers). The implementation of the R&I actions will target high TRLs and high user acceptability, attracting also new users from industry (SMEs and mid-caps) to a variety of technologies including 1) tools and sensing models, predicting and managing natural risks; 2) smart grid, water-energy saving and green fuel solutions for deep decarbonisation; 3) devices and techniques for marine ecosystem protection; 4) battery recycling solutions; 5) precision farming; 6) Sustainable Forest Management; 7) blockchain traceability system for the agri-food; 8) protective materials to improve built cultural heritage resilience; 9) robotic and sensing technologies for monitoring natural and cultural assets at risk; 10) nutraceutical products; 11) dermo-cosmetic to reduce the impact of climate change on the skin; 12) wearable devices for health monitoring.

Tech4You R&I actions will be user-driven thanks to the presence of many relevant public bodies that can be considered as end-users or that can facilitate the engagement of other categories of end-users in the validation and optimization of the results. User and technology provider interactions are scheduled throughout the project lifetime, having as an ultimate goal the achievement of high TRLs (i.e.: 8-9) concerning the technology components and the overall systems developed in its context. This orientation is even more strengthened through the adoption of an agile development schema which aims to arrive at a prototype stage relatively at the mid term of the project (M18). The realisation of Tech4You will follow an evolutionary process by iterating through a series of activities:

• the proposed iterative approach will be realised in 2 short cycles, allowing new data from the evaluations of the pilot projects to be incorporated into the product development process, revising it whenever necessary.



- Tech4You will adopt a fast-failure approach in terms of getting through the steps in the concept maturing and system evolution process. This will provide means of a rigorous assessment of options and the selection of the most suitable one based on balanced trade-offs that will not hamper the overall project progress. The project team's peripheral vision will be used to keep a live roster of opportunities, threats and challenges in the area of interest, allowing for an effective alignment to the current conditions throughout the Tech4You's lifecycle.
- The approach will allow the partners to respond to external or internal opportunities during the project's lifetime and will add to the project's agility to accommodate innovative solutions that will match emerging trends and needs at the actual time of implementation. Thus, the real potential of the final outputs to quickly reach a high level of maturity and ensure the uptake in mid/short term horizon after the and of the project



mid/short term horizon after the end of the project (1-2 years).

The partners will perform preliminary module and system assessments and validation campaigns well before the pilot demonstrations. TRL7 is considered a critical threshold, requiring a system prototype validation and demonstration in operational environments. This TRL is the ultimate milestone that is expected to be reached with the final prototype. Section C4 provides more details concerning the current, intermediate and final TRLs for the various outputs foreseen in the project. The overall implementation approach consists of five (5) interrelated phases, described in the figure.

Ministero dell'Università e

della Ricerca

B.2) Previous experiences, scientific/entrepreneurial skills, and national and international research collaborations in the topics of the research and innovation program

The following sections describe, for each partner involved in the research and innovation program, previous experiences, scientific/entrepreneurial skills, and national and international research collaborations in the topics of the program.

B2.1) ARPACAL

Previous experiences and scientific/entrepreneurial skills

Partner description: In the implementation of Law 61/94, the Law of the Calabria Region n. 20 of 3 August 1999 established the Regional Agency for the Protection of the Environment of Calabria (Arpacal), which *"works for the protection, control, recovery of the environment and for the prevention and promotion of collective health, 'objective of the integrated and coordinated use of resources, to identify and remove risk factors for man, fauna, flora and the physical environment".* Arpacal is an instrumental body of the Calabria Region, which defines its strategic objectives: 1) Support regional government action; 2) Rationalize the control activities on the sources of environmental pressure; 3) Implement the environmental monitoring activity; 4) Contribute to the development of a new culture by disseminating environmental information; 5) Develop research activities and promote the culture of innovation.

Departments and expertise: The control and monitoring activity on the territory is guaranteed by the Provincial Departments which are equipped with scientific equipment, movable and immovable property. The instrumental equipment made it possible to organize high-level chemical, bio -naturalistic and physical laboratories, capable of providing answers to various public users (Municipalities, Provinces, Prosecutors, Asp and private sectors). Thematic services operate in the provincial departments with functions of territorial control and monitoring of the various environmental matrices. Arpacal, through the Thematic and Laboratory Services, primarily carries out control and monitoring activities of environmental matrices and technical-scientific support and consultancy to Local Authorities and Health Authorities for the implementation of the tasks assigned to them by legislation in the field of prevention and environmental protection. Additional skills range from EIA (Environmental Impact Assessment), SEA (Strategic Environmental Assessment) and AIA



Ministero dell'Università e della Ricerca

(Integrated Environmental Authorization), protection of water from pollution, activities in waste management and remediation, contaminated sites, control of exposure to electric, magnetic and electromagnetic fields, as well as activities relating to air pollution. Arpacal also carries on a pool of important compulsory activities: 1) control and supervision activities. Arpacal has supervisory and control functions aimed at verifying compliance with the obligations imposed by law or by prescriptive acts of the Authority, or at ascertaining the factual conditions necessary for the adoption of further restrictive measures. 2) Support for active administration functions. Following the recently enacted general institutional reform laws and the various regulations specifically referring to environmental issues, the Regional and Local System is the holder of the active administration functions that manifest themselves in the release, usually at the request of the interested party, of measures of a "nature" punctual "having authorization or concessionary nature. ARPACAL is institutionally required to guarantee to the Entities in charge of these functions their technical support which is requested in the preliminary phase of the administrative procedure. 3) Laboratory activities for collective prevention and environmental protection. The Agency's fundamental task is to guarantee the Region, local authorities and ASPs analytical activities and any other laboratory performance in the field of collective prevention and environmental control. 4) Management of environmental monitoring networks. Together with the control of pressure factors, environmental monitoring constitutes one of the main tasks that Arpacal carries out to operationally support the prevention functions of the Region, local authorities and ASPs. 5) Management of meteoclimatic and meteorological radar services. About the hydro-meteo-pluviometric observation networks about the Region, the "MULTIRISCHI" Decentralized Functional Center has been established at Arpacal. The Functional Center has collected in Calabria the inheritance of the National Hydrographic and Mareographic Service. The Center has as its main task the systematic survey, throughout the region, of the quantities relating to the earth's climate. It also validates the data, all collected in strict compliance with national and international standards, and publishes them on the WEB, as well as provides them to all those interested. 6) Support activities for environmental damage compensation actions. Arpacal, according to the combined provisions of Article 7 of Regional Law 20/99 with art. 18 of Law 349/86 has the competence to support the Region and the Local Authorities for the exercise of the functions inherent to the promotion of the action for compensation for environmental damage. 7) Support the procedures concerning the EIA, SEA and AIA (expression of technical opinions).

<u>Project activities:</u> The Agency is included in national monitoring plans and programs, some of which are financed by the Ministry of the Environment. It can develop and implement scientific projects and implement them also in collaboration with universities.

ARPACAL role within the project: ARPACAL will participate as an affiliate partner in Spoke n° 2 "Technologies to reduce energy consumption and save biodiversity" through 7 researchers belonging to the U.O.C. CRSM - Regional Center for Marine Strategy (located in Crotone) Lead partner of the Central Mediterranean Ionian Sea Sub-region which has implemented the Operational Plan of the activities envisaged by Legislative Decree 190/10 implementing the Marine Strategy Framework Directive - 2008/56 / EC since 2015. The CRSM, through its qualified personnel and the necessary oceanographic instrumentation, operates on a series of marine environmental matrices in subordination to a series of descriptors: Descriptor 1: Biodiversity is maintained. The quality and presence of habitats as well as the distribution and abundance of species are in line with the prevailing physiographic, geographic and climatic conditions. Descriptor 2: Nonindigenous species introduced by human activities remain at levels that do not adversely alter ecosystems. Descriptor 3: Populations of all commercially exploited fish, molluscs and crustaceans remain within biologically safe limits, with an age and size distribution of the population indicative of the good health of the stock. Descriptor 4: All elements of the marine food web, to the extent known, are present with normal abundance and diversity and at levels capable of ensuring the long-term abundance of the species and the preservation of their full reproductive capacity. Descriptor 5: Eutrophication of human origin is minimized, in particular its negative effects, such as biodiversity loss, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters. Descriptor 6: The integrity of the seabed is at a level that ensures that the structure and functions of ecosystems are preserved and that benthic ecosystems, in particular, are not adversely affected. Descriptor 7: Permanent modification of hydrographic conditions does not adversely affect marine ecosystems. Descriptor 8: Concentrations of contaminants present levels that do not give rise to polluting effects. Descriptor 9: Contaminants present in fish and other marine fishery products intended for human consumption do not exceed the levels established by Community legislation or other relevant standards. **Descriptor 10**: The properties and quantities of marine litter do not cause damage to the coastal and marine





environment. **Descriptor 11**: The introduction of energy, including underwater sound sources, is at levels that have no adverse effects on the marine environment. ARPACAL will capitalize on several Regional projects including • SIC-CARLIT project - Bioecological characterization of the 14 Marine Sites of Community Interest in the Calabria Region - mapping of macroalgae according to the CARLIT method financed with POR funds for an amount equal to \notin 700,000; • MUSMAP Project - Multiscale mapping of Posidonia oceanica and Cimodocea nodosa meadows in pilot sites in the Calabria Region - financed with POR funds by the Calabria Region Environment Department (\notin 200,000); • Project within the POR CALABRIA FESR 2007/2013 intervention - AXIS III - ENVIRONMENT - Operational Objective 3.5.2 - Line of Intervention 3.5.2.1 "Environmental observatory SIN/eco - marine toxicology and biomonitoring of coralligenous matrices, Posidonia oceanica and Fauna Fish" Resolution DG ARPACAL nr. 915 of 15.12.2015

National and international research collaborations

ARPACAL is part of the Network of Environmental Agencies (SNPA) made up of ISPRA (Higher Institute for Environmental Prevention and Research) and regional (ARPA) and provincial (APPA) Agencies. The Regional Agencies for the Protection of the Environment represent a consolidated example of a federative system, which combines knowledge of the territory and local environmental problems with national and community policies for the protection of the environment.

B2.2) BIOTECNOMED

Previous experiences and scientific/entrepreneurial skills

Partner description. BIOTECNOMED SCaRL was established in 2011 and from the same date to today is the Managing Subject of the Health Technologies Innovation Hub of the Calabria Region as well as Managing Subject of the High Technology Human Health and Biotechnology District funded by MIUR. 70 subjects (companies AND ODRs) are aggregated to the Innovation Pole. The administrative office is located within the Catanzaro University Campus, while the operational headquarters is adjacent to the University. The operational headquarters is a modern structure that extends over approximately 600sqm in addition to outdoor spaces and is equipped with modern infrastructures for research and development: ICT-Bioinformatics, Bioelectronics and Biomechanics technological platforms for the design and prototyping of medical devices and innovative projects. Furthermore, within the operational headquarters, Biotecnomed has created spaces in which companies and research centres can locate their pre-competitive research and development activities, interface with and dispose of innovative technological platforms, laboratories and highly technological equipment, and benefit from advantageously a wide range of services for technological development.

Involved departments and expertise. Biotecnomed carries out activities of conception, implementation, direction for programs and projects as well as providing services with high added value. The company can count on the presence of various professional figures with high expertise: at the top of the company, there is a President, Full Professor of the University "Magna Graecia" of Catanzaro with decades-long of experience and a General Manager, administrative-accounting expert and juridical-organizational strengthened by a deep knowledge of organization and management over a decades-long career. Biotecnomed has an excellent Research and Development (R&D) Area, which deals with innovative solutions from idea to prototype and which represents the flagship of the company. There is also an Administrative Area that supports the operational part of the projects, the Technology Transfer Area and Intellectual Property (IP) service, the Communication and Marketing area. Currently, there are 9 staff units: n. 6 units with mechanical, electronic, IT, biomedical technical / engineering backgrounds; a highly skilled intellectual property expert, two units of technical personnel.

International scientific recognitions. Biotecnomed is the author of about 50 scientific publications in international journals. International activity is very flourishing, which has seen Biotecnomed protagonist in various events, including: 1) Participation in the German-Italian Innovation Conference "Investing in Italian Innovation: Smart Policies for a Digital Europe" - Berlin. 2) Participation in the initiative "A business school: European good practices", aimed at enhancing the various virtuous experiences at the local and national levels in the promotion of entrepreneurial culture in schools and universities - Brussels. 3) "Calabria Valley" project, promoted by the Italian Chamber of Commerce for Switzerland. 4) Participate in the Invest in Italy Roadshow held in Toronto and Montreal. 5) Project "Forum Italy-Canada On Artificial Intelligence" Italian Chamber of Commerce in Canada. Biotecnomed scarl has been a member of the ALISEI National Life Sciences Technology Cluster and on May 2021 it received the ECEI Bronze Label "Striving for Cluster Excellence" certificate of excellence.



Technology Transfer activities: Biotecnomed is the owner of n. 11 national/international patents.

Project activities: Biotecnomed since 2011 has assets n. 12 industrial research and experimental development projects funded under competitive tenders (PON, POR) for an amount exceeding 35 million euros, carried out in collaboration with universities and companies. The final goal of these projects was the development of devices or new technological solutions. Biotecnomed has activated numerous collaborations with universities and research centres, including: University of Magna Graecia of Catanzaro; "La Sapienza" University of Rome; Polytechnic of Turin; University of Pisa; University of MESSINA; University of MILANO BICOCCA; CNR; University of TURIN; Biogem scarl.

<u>Secondary education</u>: The company carries out training activities for doctoral students, trainees, undergraduates as well as collaborates with school-work alternation activities. In particular, it has assets n. 10 agreements with various universities and to date, it has hosted more than 50 undergraduates/trainees/doctoral students as well as more than 500 high school students for work-related alternation activities. She was also the winner of two additional industrial doctorate positions in the Mur competitions, as well as obtained funding for two research doctorate positions from the CRUI Foundation. In collaboration with the University of Catanzaro, it has participated in five, 1st level spin-off masters aimed at 25 students, for the development of new technologies and/or new industrial processes with the consequent birth of spinoffs.

<u>BIOTECNOMED</u> role within the project: BIOTECNOMED will participate as an affiliate partner in Spoke n° 5 "Technologies for a healthy nutrition and resilient communities". As part of the Spoke 5 OR 5.3 Biotecnomed boasts a decade of experience in the research and development of new devices, gained in the performance of 7 research and development projects that have seen the conception, design and development of prototypes for new wearables. The activities carried out led to the obtaining of 4 patents and the development of a new nutraceutical in collaboration with Merck Serono.

National and international research collaborations

The following are the projects carried out in collaboration with other subjects and the role assumed by Biotecnomed: • PON MISE - Fund for Sustainable Growth - PON I&C 2014-2020, as per D.D 20.11.2018. Project entitled "Role of nutraceutical supplementation with antioxidants in women candidates for medically assisted procreation techniques - GENADIS" - (Partners Biotecnomed, UNICZ, Merck Senoro S.p.A.) 2021 ongoing. • Call MISE 5 AUGUST 2019 "Public notice for the selection of projects for 5G experimentation and research - AXIS II Program of Support for Emerging Technologies" (PARTNERS Biotecnomed, UNICZ; VODAFONE SPA; MUNICIPALITY OF CATANZARO IGEA Solution Srl); 2020 - ongoing. • HEALTH TECHNOLOGIES INNOVATION POLE - POR Calabria 2014-2020 Biotecnomed Managing Authority 2018 - ongoing. • CADS design Creating a safe home environment. PON MIUR 2014 - 2020 Project Code ARS01_00920 (Biotecnomed partners, Eucentre Foundation, IUSS PAVIA, KORE ENNA university, DHITECH - High Tech Scarl Technological District; 2020-ongoing. • PON MISE - Fund for Sustainable Growth - "HORIZON 2020" Call PON I&C 2014-2020, according to Ministerial Decree 1st June 2016. Prog. n. F / 050201 / 01-03 / X32 Project MATE Multifunction Assistant for liTtle kids and the Elderly - A bracelet for life. (Lead partner Biotecnomed, Partners UNICZ and PROGESI SPA); 2017-2021 • Project "WEEPIE -WEarable Programmable device for compliance Enhancement, wearable and programmable device for improving compliance in drug-taking", POR CALABRIA 2014-2020. (Lead partner Biotecnomed, Partners UNICZ E ECUBIT SRL) 2018-2021. • MOLIM ONCOBRAIN LAB Project - Innovative molecular imaging methods for the study of oncological and neurodegenerative diseases PON MIUR 2014 - 2020 Project Code ARS01 00144. (Partners Biotecnomed, Unicz; Sdn Spa; Uni Messina, Uni Milano Bicocca, Cnr; Cps Spa; Consorzio Healthnet; Inteltec Srl; UniTo) 2018-2021. • "NADITEMM" Project - New Diagnostic And Therapeutic Approaches For Dysmetabolic Diseases - PON MIUR "Research and Innovation" 2014 - 2020 Project Code ARS01_00566. (Partners Biotecnomed, UNICZ; Consorzio Pitecnobio Scarl - ELI LYILLY SPA, UNI LA SAPIENZA, BIONAP SRL); 2018-2021. • Industrial research project NEUROMEASURES PON03PE_00009_1 development of innovative processes and support services for the early diagnosis of motor, behavioural and memory disorders in Parkinson's disease and Alzheimer's dementia. PON MIUR 2007-2013. (Lead partner Biotecnomed, Partners Istituto S.Anna, Infobyte, Itaca srl, Pegasoft srl, UNICAL, UNICZ); 2013-2017. • OPTIMA CARDIOPATHS industrial research project PON03PE 00009 4 Innovative tools for the optimization of clinical management and endovascular therapy of cardiovascular diseases. PON MIUR 2007 -2013; 2013-2017; (Lead partner Biotecnomed, Partners Istituto Gadagroup, Dedalus, UNICAL, UNICZ); 2013-2017. • Industrial research project ICARE PON03PE_00009_2 Calabrian infrastructure for Regenerative medicine: generation of biobanks for cryopreservation of human stem cells and bone tissue for clinical use and



design and development of innovative bioscaffolds PON MIUR 2007-2013; (Lead partner Biotecnomed, Partners Biogem scarl, Marrelli Health, Tecnologica Srl, UNICZ); 2013-2017. • Health Technologies Innovation Pole - Operational Program Calabria Region 2007-2013 Managing body Biotecnomed; 2011-2015.

B2.3) CNR

Previous experiences and scientific/entrepreneurial skills

Partner description: The National Research Council of Italy (CNR) is an Italian public research institution with multidisciplinary expertise, established in 1923 and supervised by the Ministry of University and Research. The staff is made of about 8,500 people working in a network made of 88 research institutes spread throughout the entire Italian territory and organized in seven Departments, according to macro-thematic areas of the research. More than 7,000 of these people are researchers or technical personnel actively supporting research activities. CNR's mission is the realization of scientific research projects in the main sectors of knowledge and to apply the research results to promote the development of Italy, by promoting innovations, fostering both the internationalization of national research and the competitivity of the Italian industrial system and advancing knowledge for the benefit of society. Present in all fields of knowledge, the CNR ranks among the leading global research institutions for its excellent research and innovation achievements. CNR researchers are committed to the numerous challenges of both nowadays and tomorrow, such as the health of citizens and earth, the status of the environment, natural resources, energy and agricultural sustainability, transports, production systems, artificial intelligence, human sciences, and new materials, to name a few. CNR is among the world's leading research institutions, while at the national level, due to a large number of researches, it is the main Italian research institution. Internationally recognized for the excellence of its scientific research, the CNR is a reference in the world of research and development, as well as for the general public. CNR researchers actively participate in international research groups, publish their research on high-impact scientific journals, leads European research projects, work as consultants for national agencies and industries and actively collaborate with the network of Italian universities.

Projects activities

International scientific recognitions: ITM is internationally recognized as a centre of excellence in membrane science and technology: it is one of the leading laboratories at the European and International levels in all aspects of membrane research. The research aims to promote innovation in the field of membranes and their application in different fields as water treatment, desalination, energy, food and agriculture, biotechnology, biomedical, gas and vapour separation. The leading role of ITM in the field is demonstrated by the numerous publications in top international peer-review journals together with the projects is coordinating and participating. In the years, ITM led and participate in countless projects with Academia, Institutions, International organizations, European Commission and Companies. ITM is involved and leading more than 30 Projects at the Regional level, National Level (MAECI, PON, PRIN, FISR), International Level (PRIMA, Ministry of Kingdom of Saudi Arabia, Bilateral project with Argentina, China, Egypt, UK, etc.), EU Projects (Innomem-H2020, Marvel-H2020, IntelWatt-H2020, Superscienceme-Marie Curie Action) and with numerous Italian Companies. **IRPI** leads or participates in several national and international research projects funded by the EU Commission and EU Space Agencies and to national projects funded by National Civil Protection and regional Agencies that in the last three years produced several funds of 6 million €. The excellence of results is witnessed by the numerous papers published each year in high-impact journals. IRPI is the Centre of Competence of the Italian National Department of Civil Protection which provides consulting services during and in the aftermath of natural disasters, also performing topographic monitoring of large landslides (i.e. Montaguto and Maierato landslides, South Italy), with innovative techniques and instruments, also used outside the natural hazard's fields, as in the monitoring of Costa Concordia shipwrecked at Isola del Giglio.

Technology Transfer activities. CNR-IRPI performs scientific and technological consulting for public authorities and private businesses. For the Dep. of Civil Protection, it developed SANF, a prototype system for the forecasting of rainfall-induced landslides in Italy, as far as, for the Italian State Railways, IRPI developed SANF-RFI, a system for the spatial/temporal forecasting of rainfall-induced landslides along the railways. Products & services: in situ and remote geo-monitoring (from the ground, by air, by satellite), hydrometeorological and groundwater monitoring, mapping of landslides and flooded areas, design of landslide and flood forecasting systems, flood and landslide hazards/risk assessments, the definition of mitigation and adaptation strategies, training and dissemination on natural hazards, the realization of large historical databases on the impact of natural hazards on territory and population throughout the decades. IRPI collaborates with undergraduate/post-graduate education on natural risks, soil conservation and civil protection. **CNR-ISAFOM**.



Alongside the creation of scientific value through the development and promotion of innovations, ISAFOM interacts with society, conveying to the public the knowledge acquired through initiatives of the so-called CNR third mission on wide-ranging topics– from climate change to innovative methodologies for precision agriculture. **CNR-ICAR.** ICAR supported the foundation of spin-offs (such as OKT, Eco4Cloud and Altilia) and provides support to scientific organizations such as HL7, UNINFO, AITIM and SIBIM.

CNR role within the project: CNR will coordinate the Spoke nº 1 "Technologies to mitigate natural risk" and will participate through 5 Institutes (IRPI, ISAFOM, ISAC, ITM and IMAA), by involving 36 researchers covering several relevant fields including: geology, hydrogeology, geo-hydrological hazards and risk, geomorphology, hydraulic engineer, hydrology, geotechnics and specifically landslides hazards, and the impact of climate change on geo-hydrological hazards and landslides. CNR will capitalize the previous experiences/projects/collaborations developed in the topic of Spoke 1 through each Institute, i.e. CNR-IRPI • Sviluppo e applicazione di metodi per valutazione della pericolosità dei fenomeni di dissesto dei versanti (POR 2000-2006). • MEPHISTO, Metodi di Elaborazione di dati SAR multi-frequenza per il monitoraggio del dissesto idrogeologico (Italian Space Agency funds); • RMS Risk Management System (FESR-FSE); • SMoRI, Smart Monitoring per il controllo di bacini ad elevato Rischio Idrogeologico (POR 2014-2020); • PON GOVERNANCE (Dip. Protezione Civile, 2017-2021) • Supporto tecnico-scientifico per monitoraggio frane, pianificazione e valutazione interventi di mitigazione del rischio da frana a Maierato (Maierato municipality); • Censimento e analisi di fenomeni franosi per la redazione dell'inventario dei fenomeni franosi, integrazione Piani Stralcio per l'Assetto Idrogeologico, Rischio frana (Autorità di Bacino Distrettuale Appennino Meridionale, on-going). CNR-ISAC will capitalize on its expertise in weather forecasts, using ground and satellite data, and related operational products. CNR - ISAFOM: statistical processing and geostatistical and multivariate analysis of data. Geo-spatial geochemical risk analysis methods and application of compositional and multifractal data analysis methods, in collaboration with Geological Survey of Finland, Natural Resources Institute Finland (Luke), Science Pomeranian University - Shupsk (PL). CNR - ISAC: • OT4CLIMA: Innovative Earth Observation technologies to study Climate Change and its impact (PON, 2018-2021); • PRISM-GIAPPONE High-resolution numerical simulations of tornadoes for using artificial intelligence (Meteorological Research Institute and Japan Meteor. Ag., 2019-2020). • Evolution of Copernicus Land Services (EU funds 2016-2019). • Comparison of tornadic supercells and their environmental conditions in Japan and Italy (Bilateral Italy-Japan, 2016-2019). • SIGIEC is an integrated approach for coastal erosion contrast (PON, 2012-2015). CNR-ITM: experience in developing prototypes on: a) membrane processes integrated with solar panels for using them in remote areas, to be used for drinking and irrigation purposes; b) development of membrane prototypes for the purification of waters contaminated from toxic pollutants (e.g. arsenic, hexavalent chromium, fluorine, etc.) to be used for drinking and irrigation purposes. • AsSE, SEparazione dell'ArSenico dalle acque mediante processi a membrana (FESR-FSE 2014-2020). CNR-IMA will capitalize the following projects: • Sperimentazione rilievo satellitare ai fini della previsione e lotta agli incendi boschivi (Regione Lombardia funds). • Satellite survey experimentation for forecasting and fighting forest fires (Regione Lombardia funds) (Dip. Nazionale Protezione Civile). • SPOT, Sviluppo di una Piattaforma per l'erogazione di servizi innovativi basati su dati di Osservazione della Terra (FERS, 2014-2020). • OT4CLIMA, Development of innovative Earth Observation technologies for the study of Climate Change and its impacts on the environment and territory (PON 2014-2020). • Investigating Spectroscopy and Forward Model Improvements for Atmospheric Retrieval of Methane in the Thermal Infrared (ESA). • Combined MWS and IASI-NG Soundings for Cloud Properties (EUMETSAT). • Utilisation of Reconstructed Radiances from IASI For Atmospheric Chemistry and Air Quality Applications (EUMETSAT). Collaborations: • Space Science and Engineering Center, Univ. Wisconsin • EUMETSAT-Land-SAF • Ente Parco Pollino • Protezione Civile Lombardia, Basilicata, Sicilia • Dip. Nazionale Protezione Civile. CNR - IMAA - Satellite survey experimentation for forecasting and fighting forest fires (Regione Lombardia funds). • Development of satellite techniques for early warning and near real-time monitoring of extreme events (i.e. forest fires) (Dip. Nazionale Protezione Civile). • SPOT, Development of a platform for the provision of innovative services based on Earth Observation data (FERS, 2014-2020). • OT4CLIMA, Development of innovative Earth Observation technologies for the study of Climate Change and its impacts on the environment and territory (PON 2014-2020). • Investigating Spectroscopy and Forward Model Improvements for Atmospheric Retrieval of Methane in the Thermal Infrared (ESA). • Combined MWS and IASI-NG Soundings for Cloud Properties (EUMETSAT). • Utilisation of Reconstructed Radiances from IASI For Atmospheric Chemistry and Air Quality Applications (EUMETSAT). Collaborations: • Space Science and Engineering Center, Univ.





Wisconsin • EUMETSAT-Land-SAF • Ente Parco Pollino • Protezione Civile Lombardia, Basilicata, Sicilia • Dip. Nazionale Protezione Civile.

CNR will also participate as an affiliate partner in the following Spokes:

Spoke n° 2 "Technologies to reduce energy consumption and save biodiversity": CNR participates through 7 different Departments (ITM, IIA, ISAC, ICAR, ISM, ISTP, IMAA) by involving 50 researchers with expertise covering several relevant fields including: diamond; thermal and harsh environment materials and applications; PLD systems, computing and high performance networks. CNR will capitalize on researchers' background and on several European and National projects that have been implemented by the staff of the Institute in the past years about the topics of the spoke.

Previous experiences of each Institute in the topic of Spoke 2: CNR - ITM The scientific background of researchers as proved by numerous papers published in high-impact international journals. ITM has the expertise in developing innovative membrane prototypes proposed in this Spoke. The strategies for solving the problems of water treatment and reuse of waste, together with the instrumentations available at ITM, besides the technicians and administrative staff support actions, make ITM completely operative to successful drive and complete the proposed project. • SMARTMATTER, Core integration of novel functional, adaptive materials into a smart, highly sensitive analytical system for point of need environmental applications (EU funds, 2020); • BIOVALUE, Advanced Membranes for biogas upgrading and high added-value compounds recovery (EU funds, 2019-2022); • AsSE, SEparazione dell'ArSenico dalle acque mediante processi a membrana (FESR-FSE, 2017-2021); • RAVEL, Recovery and valorization of oil vegetation water for novel applications Eco-friendly in the tanneries processing (FESR, 2017 - 2021). CNR - IIA • Azioni di monitoraggio di Rete Natura 2000 su habitat e specie della Puglia (POR 2014-2020); • COHECO Sistema Integrato di monitoraggio, allerta e prevenzione dello stato di COnservazione di Habitat ed ECOsistemi in aree interne e costiere protette e da proteggere (FESR-FSE 2014-2020); • BIOdiversity multi-SOurce monitoring System: from Space TO Species (BIOSOS) (EU Funds); • Bando Aerospazio Lazio DM20877-CADMO (MIUR, 2008-2012); • DT4GS Digital Twin for Green Shipping (EU Funds, 2022-2024); • ROMEO Realizzazione Sistema Online per la Misura delle Emissioni Odorigene (POR FESR, 2022-2023); • ISAAC Increasing Social Awareness and acceptance of biogas and biomethane (EU Funds, 2016-2018); • Chemical characterization of ultrafine particles emitted from cement plants (Private company Buzzi-Unicem funds, 2018-2020); • Monitoring of ozone precursors according for setting up a VOC monitoring Network (Italian Ministry of the Environment, ongoing). CNR - ISAC • Smart Data Cloud (MISE, 2017-2019). • IRPWIND, Integrated Research Programme On Wind (EU funds, 2014-2018). • RES-NOVAE, Smart Energy Master per il governo energetico del territorio (PON, 2012-2015). CNR - ICAR Projects COGITO and DOMUS, and the results in the Internet of Things, Cyber-Physical Systems, Multi-Agent Systems, Artificial Intelligence and Edge Intelligence matches with the goals of the Spoke 2 in distributed data collection and processing, management of heterogeneous systems, Artificial Intelligence on the Edge. • Smart and healthy living at home (EU Funds, 2019-2021). CNR - ISM Experience to demonstrate the proposed technology in an industrially relevant environment (TRL 6), with the possibility of developing a prototype of the system (TRL 7). ISM represents a professional research centre able to tackle the new challenges presented by the development in material science and promote a detailed physical and physical-chemical understanding of classical and quantum processes governing material behaviour. CNR - NANOTEC More than 30 articles in peer-reviewed indexed journals on surface forces and adhesion of soft and biological materials related to an action of the spoke. CNR - ISTP The acknowledged expertise of researchers in non-equilibrium plasma characterization is testified by numerous papers in JCR journals, with a large impact on the topic of the CO₂ activation and conversion in plasmas, contributing to the international community's efforts towards the technological exploitation of low-temperature plasma devices.

Spoke n° 3 "Technologies for sustainable food supply chain and forestry": CNR participates through **ISAFOM** and 9 researchers that will capitalise on \bullet scientific collaborations with both Italian universities and CREA research centres and with the Universities of Zagazig (Egypt) and Zagreb (Croatia). \bullet E-Crops, Technologies for Sustainable Digital Agriculture (PON 2014-2020); and through **NANOTEC** that will rely on synergies with a research network (Universities & Private Companies) to develop the smart sustainable greenhouses and activities related to the preparation of electrochromic thin film performed in the projects: \bullet Meraviglie (POR) and \bullet Smartlayer (POR).

<u>Spoke n° 4 "Technologies for a resilient and accessible cultural and natural heritage"</u>: CNR participates involving 7 researchers through **ISAFOM** that will capitalize on • NUTRAGE Environment and Wellbeing





(FOE CNR); Tranquillity Areas Mapping in the Sila National Park (ERASMUS + Cultural and Natural Heritage Integrated System: a multidisciplinary approach to promote sustainable tourism); and through **IMAA** that will capitalize on its experiences in Archaeometry, Clay mineralogy and Geochemistry, Environmental Mineralogy, in particular: mineral and clay mineral spectroscopy (micro-Raman, IR, micro-XRF, XPS, solid-state NMR), diffractometry (PXRD and micro-XRD), thermal analysis (TG-DSC), optical and electron microscopy, multivariate statistics, dating, • Archaeometry in Basilicata (Scuola Specializzazione in Beni Archeologici di Matera & IMAA), • Medieval Archaeometry in Basilicata (Scuola Specializzazione in Beni Archeologici di Matera & IMAA), • MeTIBas (Metodologie e Tecnologie Innovative per i Beni Culturali della Basilicata) (FESR).

National and international research collaborations

In the years, ITM led and participate in countless projects with Academia, Institutions, International organizations, European Commission and Companies. ITM is involved and leading more than 30 Projects at the Regional level, National Level (MAECI, PON, PRIN, FISR), International Level (PRIMA, Ministry of Kingdom of Saudi Arabia, Bilateral project with Argentina, China, Egypt, UK, etc.), EU Projects (Innomem-H2020, Marvel-H2020, IntelWatt-H2020, Superscienceme-Marie Curie Action) and with numerous Italian Companies. Related to Transfer Technology, two years ago the first spin-off company Seligenda Membrane Technology Srl has been created by the collaboration of ITM and UNICAL. By the end of 2022, it is planned the creation of a new Spin-off, focusing on membrane process and fabrication related to water treatment, as a follow-up of the Proof of Concept (POC)-Project funded by MiTO Technology (Progress Tech Transfer Fund) in 2021.

Collaborations have been established thanks to the realization of numerous projects: **CNR-ITM** • AMECRYS Revolutionizing Downstream Processing of Monoclonal Antibodies by Continuous Template-Assisted Membrane Crystallization (EU funds, 2018-2021); • INTELWAT intelligent Water Treatment Technologies for water preservation combined with simultaneous energy production and material recovery in energy-intensive industries (EU funds, 2020-2024); • INNOMEM Open Innovation Test Bed for nano-enabled Membranes (EU funds, 2020-2024); • VICINAQUA Integrated aquaculture based on sustainable water recirculating system for the Victoria Lake Basin (EU funds, 2016-2019); • IDEA Environmental challenges and solutions for vulnerable communities (EU funds, 2017-2021); • TRUST Management of industrial Treated wastewater ReUse as mitigation measures to Water Scarcity in climate change context in two Mediterranean regions (EU funds, 2021-2024); • MATCHING Materials Technologies for performance improvement of Cooling Systems in Power Plants (EU funds, 2016-2020).

CNR-IMAA EU Funds: • ACTRIS-IMP, • e-SHAPE; • CORDINET; • GAIA-CLIM; • ACTRIS-2; • ACTRIS PPP, ENVRIPLUS; • ENVRI-FAIR; • ATHENA; • ECARS; • EUNADICS. COSME program: • SERV FORFIRE; • DustClim. ESA projects: • ARTEK, • EC-ACTS, • WRAD. EUMETSAT Projects: • ComboCloud, APPLES. National Projects: • ACTRIS, • ICOS, • GRINT, • PON OT4CLIMA. CNR-IIA • The European Network for observing our changing planet (EU Funds); • DivAirCity, The power of diversity and social inclusion as a mean for reducing air pollution and achieving green urban nexus in climate-neutral cities (EU Funds); • IANOS IntegrAted Solutions for the DecarbOnization and Smartification of Islands (EU Funds); • ECOPOTENTIAL: Improving future ecosystem benefits through Earth Observations (EU Funds). **CNR-ISM** AMADEUS, Next GenerAtion MateriAls and Solid State DevicEs for Ultra High Temperature Energy Storage and Conversion, (EU funds, 2017-2020). • DMS, Dielectric MicroSpacer Technology (EU funds, 2017-2018). • ProMETHEUS, Production Method Of Electrical Energy by Enhanced Thermal Electron Emission by the Use of Superior Semiconductors (EU funds, 2013-2016) • STAGE-STE, Scientific and Technological Alliance for Guaranteeing the European Excellence in Concentrating Solar Thermal Energy (EU funds, 2014-2018). CNR-NANOTEC The majority of active projects concern 'green' technologies for environmental monitoring, energy efficiency, precision medicine and bioengineering. In 2017, Nanotec founded • TECNOMED, a joint technopole with Apulia Region (Inst. Giovanni Paolo II for Tumor research, Bari, & University of Bari), for translating into clinical practice the progress made in nanoscience. CNR-ISTP • APULIA SPACE, Sviluppo di Tecnologie Abilitanti nei segmenti Spazio, Terra e Utente (PON 2013-2016); PHYS4ENTRY Planetary Entry Integrated Models" (EU Funds, 2010-2014). CNR-ISAFOM • INTACT (EU funds, 2022-2025); • PON area Agri-food (Progetto e_crops 2021-ongoing); • MOSOM Mapping of Soil Organic Matter (EU funds, 2021-ongoing); • SMARTIES Real-time smart irrigation management at multiple stakeholders' levels (EU funds, 2018-ongoing); • LANDSUPPORT (EU funds); • Managing forests for multiple purposes: carbon, biodiversity and socio-economic wellbeing (EU funds, 2015-2018); • BEFORE



Bioresources For Oliviculture (PON 2007_2013); • AlforLab Laboratorio PubblicoPrivato Per L'applicazione Di Tecnologie Innovative Ad Elevata Sostenibilità Ambientale Nella Filiera Foresta-Legno-Energia (PON 2014-2022).

B2.4) CREA

Previous experiences and scientific/entrepreneurial skills

Partner description. CREA is the leading Italian research organization dedicated to agri-food supply chains. It operates as a legal entity under public law, and are supervised by the Ministry of Agricultural, Food and Forestry Policies (Mipaaf). Its scientific activity covers agricultural crops, livestock, fishery, forestry, agro-industry, food science – and socio-economics. CREA deal with the great challenges of the twenty-first century related to food production sustainability, following the principles of the circular, bio-based economy through a multidisciplinary approach that includes innovation transfer. Specifically, CREA carries out activities in the field of biosystem engineering, for the sustainable management of agroecosystems and agricultural, agri-food and agro-industrial chains.

It is also specialised in High-tech agromechanics and digital agriculture, collection and transformation of biomass for energy and non-food purposes, Agro-food processing (olive trees, cereals, fruit and vegetables). CREA's objectives are:

Departments and expertise. CREA employs over 2,000 people, half of whom are researchers and technologists. The Olive, Fruit and Citrus Crops Centre carries out research activities for the improvement of the supply chains, developing technologies for genetic improvement, genomics, propagation, sustainability of production and quality of fruits and fruit products, up to the valorization of by-products. It is responsible for the preservation, characterization and enhancement of fruit, citrus and olive collections.

Technology Transfer activities: • Agreement for the implementation of an agricultural mechanization project in Costa Rica (PF COSTA RICA, ICE). • Transfer Agreement of knowledge on the mechanization of open field crops in developing countries or countries with little knowledge and technologies; PF MoU between the Italian State and the Philippines. • Consultancy and agreements for the development of digital technological applications (smart-sensors, IoT), analysis of images (chromatic, hyperspectral and thermal) and multivariate and robust predictive or inferential analysis of large data sets. CREA also organizes the GEN40LIVE INFODAY & MATCHMAKING.

Project activities: Demonstration and dissemination on the use of biomass from dedicated plantations and forest formations of territorial proximity, PF AGROENER. Demonstration and dissemination on the use of biomass from dedicated plantations and forest formations of territorial proximity, PF AGROENER; CREA-ING demonstration centre: Biomass, biogas / biometa energy chain o: use of biomass and quality of emissions from combustion systems in the use of biogas / biometa o, syngas and biomass; PF AGROENER; Testing and certification of biomass boilers and thermal engine systems. Training and technology transfer in developing countries and with food and nutritional problems; International cooperation, G-Tek Conventions; Technological and technical-legal transfer in the agri-food sector to third countries; activity of international cooperation for "institutional building". HI-TECH monitoring of Lazio's olive growing Project: Proposal for the PEI Operational Group - Measure 16.1, PSR Lazio Region.

<u>CREA role in Digital transformation</u>: CREA aims to make available to the various stakeholders the CREA databases (soil, climate, microorganisms) and models (static and simulation), useful for agricultural management, which are generally not accessible to end-users. The metadata standards and the open data access paradigm will be met in the process and interoperability between CREA databases and those available on the national territory will be fostered, promoting standardization and homogenization. The use of open data from remote sensing provides time and spatial continuity, and the accessibility to cloud-computing free platforms enables users to work on a global scale. Several research methods (field trials, agro-ecological indicators, simulation models) are integrated to provide stakeholders with information on climate risk, environmental impact, ecosystem services. Important outputs are the development of agrotechnical routes, oriented to climate mitigation and resilience, and the definition of strategies to enhance the biodegradable fraction of byproducts of agricultural, industrial and urban activities in a perspective of the circular economy.

<u>Secondary school</u>: Following the provisions of the Charter for Researchers, formally adopted by a note of the Extraordinary Commissioner on 11 July 2016, the CREA undertook to launch the Human Resources Strategy for Researchers (HRSR), obtaining the HR EXCELLENCE IN RESEARCH award in 2018. In this context, among the activities provided for in the "Action Plan" submitted to the European Commission, there is also the promotion of employment opportunities for researchers and technologists at foreign institutions and institutions.





<u>CREA role within the project</u>: CREA will participate as an affiliate partner in Spoke n° 3 "Smart technologies for sustainable agri-food chain and forestry" through 7 researchers with expertise on food traceability, nutraceuticals, molecular biology and genomics, food biotechnology, bioinformatics, use of modern biotechnologies, soil and plant microbiota/microbiome, characterization of phytopathogens, etc. CREA will capitalize on the project • GEO40LIVE: CREA with its Center for Olive, Fruit and Citrus Crop, is one of the 2 Italian partners and participates in all the objectives and actions of GEN40LIVE with a multidisciplinary team of researchers who will help select over 500 olive tree genotypes for resistance/tolerance to Xylella fastidiosa. CREA will rely also on ongoing research activities on: • "Variety innovations through traditional genetic improvement and new biotechnologies and the enhancement of agrobiodiversity to support sustainable and quality in fruit, citrus and olive production chains"; • "Innovations in production methods with particular reference to the digitisation and optimisation of cultivation operations"; • "Implementation of agro-ecological techniques in organic fruit farming" National and international research collaborations; • Integrated systems for crop protection; • Quality, traceability, trackability and valorization of pre- and post-harvest production.

National and international research collaborations

CREA, directly or as a representative of the Ministry of Supervision, operates through its researchers, participating in the work of many technical tables, committees, working groups at the national and international level (FAO, OECD, G2O, G7, SCAR, OIV, COI, etc.) where it provides qualified expertise in specific areas of expertise. As part of its efforts to promote scientific and technological cooperation, CREA has signed several international bilateral (with countries from America, Asia, Europe, Africa) and multilateral agreements (e.g. FAO, ACT, CNR, CREA, ENEA ISPRA,CIHEAM, IILA). These agreements, entered into with counterparts and international organisations, have been designed to encourage the mobility of researchers, the growth processes on new thematic areas and aggregations around research topics of major interest for the implementation of large studies and joint participation in international funding opportunities. In the pursuit of its institutional aims, CREA has over the years joined various international scientific bodies and networks that bring together representatives of the European and global scientific community. CREA's presence in these contexts is ensured through the participation of its own appointed researchers representing the Body to enhance and develop scientific confrontation and aggregation around research topics of relevant and emerging interest, encouraging transnational cooperation and the activation of synergies with other research institutions.

B2.5) EIT MANUFACTURING

Previous experiences and scientific/entrepreneurial skills

Partner description: EIT MANUFACTURING is supported by the European Institute of Innovation and Technology (EIT), a body of the European Union. It is one of eight innovation communities within EIT. EIT Manufacturing's main goal is to bring European stakeholders focused on manufacturing together in innovation ecosystems that add unique value to European products, processes and services and inspire the creation of globally competitive, resilient, and sustainable manufacturing. Furthermore, it is connected to initiatives that support digital transformation and data infrastructure (e.g. GAIA-X). EIT Manufacturing brings together more than 70 organisations from business, education and research from 17 countries, working on the industrialization and commercialization of technologies that are close to the market. EIT Manufacturing strategy is articulated according to three Pillars, namely: Innovation, Business Creation and Education. EIT Manufacturing has headquarters in Paris and has several Co-Location Centers (CLCs) across Europe, one of which is located located in Italy, in Milan. EIT Manufacturing was established with a vision that global manufacturing will continue to be led by Europe and contribute to making Europe and its manufacturing sector more competitive and sustainable.

Involved departments and expertise: The Co-Location Center South (CLC South) of EIT Manufacturing can count on a highly qualified and diversified team, hence contributing relevant skills in the following key areas: Business creation and development, Communications & Dissemination, Education, Entrepreneurship, Digital Transformation, Internationalisation, Open Innovation, Research and innovation policy, Technology foresight, Technology transfer. Based on this set of skills, EIT Manufacturing South has been participating in strategic initiatives and projects playing different roles such as the creation of ecosystems, community building, networking and multiplier, match-making (e.g. industry), open innovation, business acceleration and exploitation, contribution to policy-making, support to communication and dissemination activities. One peculiarity of the EIT Manufacturing team, given the multi-year experience gained with KICs (Knowledge and Innovation Communities), is the capability to establish and manage complex innovation ecosystems.





International scientific recognitions: EIT Manufacturing is by definition an Innovation Ecosystem that given its distributed nature across Europe, the matrix organisation and diversified partnership are intrinsically complex to manage. Indeed, the partnership comprises very different types of organisations, spanning from very large enterprises to SMEs, from universities and research institutions to startups and scaleups. Likewise, the international dimension in the case of CLC South translates into managing 8 different countries, with different laws, languages, cultures, etc. Another relevant element, during 2021, CLC South has organised or co-organised (in partnership with other local organisations) 22 events, in physical/hybrid/online format, involving more than 650 participants.

Technology Transfer activities: EIT Manufacturing supports innovation, bringing knowledge from universities and research institutes to real use in industry. It connects to the right partners within the ecosystem, ensuring adoption of innovations with manufacturers as end-users and improves go-to-market while ensuring a robust scaleup. EIT Manufacturing is supporting European manufacturing companies and tech organisations in launching and industrialising demonstrated breakthrough solutions with high business growth potential. To achieve its goals in terms of innovation, EIT Manufacturing has launched AGORA, namely the new social network and open innovation platform for the pan-European manufacturing community. AGORA has already gathered more than 1,000 members since 2021. EIT Manufacturing brings together a growing network of toptier industrial partners, leading academic and research institutions from across the region and innovative startups, scale-ups and SMEs. A key way of transforming knowledge into a value is by overcoming the fragmented nature of many innovation networks, to ensure that innovations reach the market, the industry has the right talent and entrepreneurs can thrive. The innovation and technology transfer paradigm promoted by EIT is based on the recognition that a competitive, knowledge-based economy capable of sustainable growth requires integration of the three sides of the so-called Knowledge Triangle: Education, Innovation and Business Creation. By bringing the three sides of the Knowledge Triangle closer together, EIT enables the innovation that will help Europe flourish economically while growing sustainably. As an EIT Knowledge and Innovation Community (KIC), EIT Manufacturing unites educators, researchers and entrepreneurs in the industry in collaborations that further innovation in manufacturing.

EIT MANUFACTURING role in Digital transformation: EIT Manufacturing is well-positioned to drive the Digital Transformation of the manufacturing sector in Italy and Europe, promoting the establishment of well-functioning value networks that need a strong base in the form of secure digital business platforms and industrial data spaces. In this respect, one of the strategic innovation areas, or Flagship, identified by EIT Manufacturing is called Digital & Collaborative Solutions for Innovative Manufacturing Ecosystems and fosters the creation of digital and digitally enhanced solutions, including data spaces, to enable trustworthy digital marketplaces and cognitive assistance for efficient collaboration across companies, sectors and value chains.

Secondary education: EIT Manufacturing has launched five EIT Labelled Master Programs, and the EIT Labelled Doctoral Program that has started with the first cohorts of students in 2021. The most recent Master Program, Data Science and AI for Competitive Manufacturing has been launched in 2021 and it is collecting applications to start with the students in 2022. Like for innovation, the education activities are supported by a digital learning platform called Skills. In addition to the learners involved in each education activity, few pilots were conducted to experiment with the integration of digital courses in a blended learning format, held also by third parties, different from the authors. Moreover, EIT Manufacturing promotes the Teaching and Learning Factory models, which represent a realistic manufacturing environment containing didactical instruments and equipment, effectively creating the work conditions of a real industrial site for didactic and training purposes

EIT MANUFACTURING role within the project: EIT MANUFACTURING will participate as an affiliate partner in Spoke n° 2 "Technologies to reduce energy consumption and save biodiversity" through 8 experts on Process engineering, Project management, Education Developing, Mentorship, Business creation, Innovation management, Global partnership specialisation, Energy applied research. EIT MANUFACTURING will contribute to boosting the TRL of the spoke results.

National and international research collaborations

EIT Manufacturing has more than 100 ongoing activities that are grouped under five areas: the four pillars of Business Creation, Education, Innovation and the Regional Innovation Scheme (RIS), along with Cross-KIC activities, which are the result of cooperation between several EIT Innovation Communities. A strategic area for EIT Manufacturing is represented by the Flagship *Low Environmental Footprint Systems & Circular Economy for Green Manufacturing*, which is using new technologies to minimise the use of resources, energy, and material in production systems to enable new circular business models. In this respect, relevant examples





of international research and innovation activities supported and managed by EIT Manufacturing are: a) ZELDe (2021-2022) - Zero-defect wELDing for e-mobility. The project aims to create a self-developed and upgradable process control schema for battery production. Additionally, the QA functions of the system will be utilized to introduce automatic certification of each weld/battery module as regards the joint's quality. By utilizing Reinforcement Learning, ZELD-e will introduce, evaluate and standardize new methodologies and approaches as regards process control in laser welding processes. b) FLEX-BD (2022) - Flexible Battery Dismantling. The project will undertake the design of a flexible automated process that allows disassembling battery packs to improve the quality of the recycling operations. Such a process poses severe challenges for human-based disassembly: firstly, it exposes human operators to dangerous chemical substances and high voltage devices; secondly, it demands dull and repetitive tasks rather than more high added value activities dealing with effective production plans that would adaptively match the product variety.

B2.6) ENGINEERING

Previous experiences and scientific/entrepreneurial skills

Partner description: Engineering Ingegneria Informatica S.p.A. (hereafter ENG) is a Digital Transformation Company, the leader in Italy and expanding its global footprint, with around 12,000 associates, with over 40 offices spread across Europe, the United States and South America and global delivery. ENG is involved in several projects related to climate change (see below).

Departments and expertise: The ENG R&I division is formed by over 450 researchers and data scientists (and a global innovation network of universities, start-ups, and research firms). ENG invests in international R&D projects while exploring ground-breaking technologies and developing new business solutions. The R&I division is organised in Labs addressing the following application-oriented topics: Industry4.0, Smart Agrifood, Physical and Cyber Security, Defence, e-Health, Smart Cities, Innovation in PA and Services, Energy, Cultural Heritage, Media and Telco. The R&I division is also engaged in technology-oriented topics, such as Cloud Computing, IoT, Big Data, AI, Distributed Ledger Technology, Semantics Technology, Natural Language Processing, Robotics.

International scientific recognitions: The 40+ years presence in all market segments (Finance, Healthcare, Agrifood, Utilities, Manufacturing, Retail, Public Administration, Transport, Security, Defence, Space) has allowed ENG to build a deep knowledge of business needs and anticipate them by exploring constantly the evolution of technologies in the field of Cloud, Cybersecurity, Metaverse, AI, Big Data. The R&I division has produced about 160 scientific publications over the last 10 years.

Technology Transfer activities: The ENG Group, consisting of over 20 companies in 12 countries, has been supporting the continuous evolution of companies and organizations for more than 40 years, with a diversified portfolio built around proprietary solutions, best-of-breed market solutions, and managed services. R&I division has produced several prototypes (more than 200) that have been delivered in the context of the research projects. Several of them have been adopted, evolved and further exploited by the Business Units in commercial projects. Among others, the adoption at the ULSS 6 Euganea, an avant-garde hospital at Italian and European level made up of 7 hospitals distributed in the Province of Padova and serving more than 900,000 inhabitants in the area, of **ICU-Medical Record**, a real "digital assistant" for doctors and nurses in the care-intensive areas. **Project activities:** For the last 10 years, more than 200 research projects have been run by ENG. Among them, 138 are in the Horizon 2020 EU Programme (31 of them have been coordinated by ENG), with a total received funding of about 62M. The most relevant are: • SUMMIT that delivered an environment to design, emulate, execute, monitor and control distributed software systems based on IoT, embracing the Digital Twin paradigm. URBANAGE - Enhanced URBAN planning for age-friendly cities (H2020-DT-Transformations-02; 2021-2024). The project uses an inclusive co-creation strategy and disruptive technologies such as urban Digital Twins, big data analytics, AI. • URBANITE - Supporting the decision-making in URBAN transformation with the use of dIsruptive Technologies (H2020-DT-Transformations02; 2020-2023). URBANITE will analyse the impact, trust, attitudes of civil servants, citizens and other stakeholders on the integration of disruptive technologies (AI, DSS, big data analytics and predictive algorithms) in data-driven decision-making processes in the urban transformation field and validate its results by piloting mobility use-cases. • SPOTTED - Satellite oPen data fOr smarT ciTy sErvices Development (CEF-TC-2020-2 Public Open Data; 2021-2024). SPOTTED aims to create an innovative high-performance data infrastructure to enable the automated collection, combination, management, processing, enrichment, securing & privacy-preserving of heterogeneous datasets to support decision-makers in Green Areas management. • PON MIUR 2017 ReCITY (Resilient City-



Everyday Revolution) Environment and Natural Disasters: the solution is a social, economic, and technology system, built together with the community to enhance the existing resilience practices.

ENG role in Digital transformation: ENG is involved in several digital initiatives: • DIGITAL ENABLER, to harmonize, integrate, visualize, mashup, analyze data to power digital transformation processes. The Digital Enabler was defined and developed in Smart City-related innovation projects (funded by EIT Digital) and then evolved and applied in different domains in collaboration with the Business Units of Engineering Group. • SELECT for Cities (Pre-Commercial Procurement; 2017-2019). to enable large scale co-creation, testing and validation of urban IoE applications and services. ENG was the lead contractor of one of three Consortia that completed the third phase of the project (the Living Lab), testing its digital platform in real life in Antwerp & Helsinki. • DE4Bios is a bio-surveillance platform that provides updated status information in real-time on the evolving epidemic in Veneto and Lombardia. • DIOMEDEE, a telemonitoring and telemedicine solution against the Covid emergency. • ICU-Medical Record, a next-generation solution that supports health professionals for the diagnosis, planning and execution of therapeutic procedures. • iCare Assistant, a new experimental service model able to accompany the client throughout the journey from home to the clinic, also offering, within the Navile Healthcare Center in Bologna, a new concept of "UltraLuogo", through the consultation of augmented reality services. • ALIDA: Big Data Analytics as a Service: Data Science and Machine Learning platform for rapid application prototyping and deployment, enabling and supporting augmented analytics and ML-Ops processes and practices.

ENG role within the project: ENG will participate as an affiliate partner in Spoke n° 6 "Digital transformation and technology transfer" involving 20 experts able to frame the digital solutions supporting the needs of the thematic spokes within an architectural platform that will allow easy prototyping. In particular, they will be responsible for designing and implementing the platform, by devoting care to providing transparent mechanisms at the back-end level to deal with sensors and IoT and to design the interfaces to smoothly interact with the users. ENG will also define and implement some digital solutions to be plugged on top of the platform and of managing the integration of the solutions provided by the other partners in the spoke. ENG will capitalize on several projects: • B-WaterSmart: Accelerating water-smartness in coastal Europe (H2020-CE-SC5-04; 2020-2024). B-WaterSmart brings together 6 European cities and regions as living labs to address water-related challenges through a participatory approach for co-creation & development of solutions. • Gotham: Governance tool for sustainable water resources allocation in the Mediterranean through Stakeholder's collaboration. Towards a paradigm shift in groundwater management by end-users (PRIMA, Partnership for R&I in the Mediterranean Area; 2020-2023). GOTHAM aims to develop and validate a user-driven tool that enables optimal allocation of water resources from an environmental, social and economic perspective. WOeMS: Copernicus Assisted Lake Water Quality Emergency Monitoring Service (H2020-LC-SPACE-18-EO; 2021-2023). WQeMS will provide extensive information about water quality by building a multi-temporal and high spatial resolution monitoring framework. • UNALAB: Urban Nature Labs (H2020-SCC-02; 2017-2022). UNALAB aims to develop a European framework of robust and replicable nature-based solutions to address urban challenges related to climate change and water management issues, by implementing Living Lab demonstration areas in Tampere, Eindhoven and Genoa. • Sustainability Enabler: Sustainable and data-driven city planning focused on climate domain (EIT Digital-Digital Cities; 2018). The project aimed to improve supporting actions towards climate sustainable (digital) services adoption in the urban territory by better re-use of data available.

National and international research collaborations

ENG actively participates in international initiatives aimed to foster innovation in different areas: • Gaia-X: ENG is a member of Gaia-x board of directors and participate in the following WGs: Federation Services, Architecture, Portfolio, X-Association, Provider; • EIT Digital (European Institute of Innovation and Technology) where ENG is a core partner; • BDVA (Big Data Value Association)/DAIRO: ENG is a founding member, board of directors member, active participant in different working groups and leader of those in: Security, Smart City and Government, Energy and Smart Manufacturing Industry; • FIWARE Foundation: ENG is a founding member, BoD Chair, active contributor of Generic Enablers, member of the Technical Steering Committee; • International Data Space Association (IDSA): ENG is a board member. Furthermore, the company is co-founder of the **Big Data Value cPPP**, co-founder of the European initiative **Future Internet PPP**, partner of the **Alliance for the Internet of Things** (AIOTI PPP), board member of the **European Organisation for Security** (EOS) and **European Cyber Security Organisation** (ECSO), and co-founder of **NESSI** (Networked European Software and Service Initiative). It is an active member of many international



open-source communities and the founder of **SpagoWorld**, a free/open-source initiative managed by ENG. The company is a member of **OW2 Consortium** and **Eclipse Foundation**. It is also collaborating with **OASC** (Open and Agile Smart Cities) and is supporting **Living-in.eu** movement.

B2.7) ENM

Previous experiences and scientific/entrepreneurial skills

Partner description: The Ente Nazionale per il Microcredito (ENM) - National Microcredit Agency - is a noneconomic public body that exercises important functions in the field of microcredit and microfinance, at the national and international levels. According to Law 106 of July 12, 2011, art. 1, paragraph 4 bis, the ENM has been attributed the functions of the national coordinating body with the tasks of promotion, guidance, facilitation, evaluation and monitoring of microfinance instruments promoted by the European Union as well as microfinance activities carried out using European Union funds. Technology transfer and digital transformation are part of ENM's mission and institutional activity. ENM supports also green transformation through its ordinary activities, therefore through entrepreneurial microcredit and tutoring services, acted by the 521 Operators in non-financial auxiliary services of assistance and monitoring for microcredit (Tutors), trained by ENM and registered in the mandatory national list referred to in Article 13 paragraph 1 bis Law 225/2016. In particular, the activity of supporting the green transformation of businesses is carried out by ENM tutors within the ordinary process of financing and tutoring, also because an increasing number of businesses (both new and existing) are heading towards more sustainable business models.

Departments and expertise: ENM can provide economic operators with specially engineered financial instruments, such as: entrepreneurial microcredit; social microcredit; micro-insurance; micro leasing; microcredit for housing; social impact bonds; social lending; green bonds; crowdfunding. ENM has significant experience in managing and coordinating complex projects, and indeed ENM records more than 100 million euros of funding managed for the implementation of projects based on European, national and regional funds.

Technology Transfer activities: The last call4project of Officina dell'Innovazione collected 23 innovative business ideas, of which 5 were selected and had access to: 1) an acceleration path that allowed the winners to consolidate the plan for the launch of their idea or business; 2) the possibility of access to financial tools, such as entrepreneurial microcredit; 3) access to an ecosystem of national and international investors. ENM has its own Innovation Hub, called "Officina dell'Innovazione", that has been financed within the "PON Legalità FESR/FSE 2014-2020 – Asse 4" through a project with a total budget of 14.5 million euro. Officina dell'Innovazione aims to support the development of ideas, projects and startups to stimulate innovation for the benefit of the territory.

Project activities: Also, ENM has recently initiated a project with the Region of Sardinia which aims to improve the quality, effectiveness and efficiency of the regional micro and small enterprise system, fostering environmental sustainability and the transition of Sardinian companies to more ecological and sustainable business models. In particular, the project offers to the target companies training, tutoring, coaching, capacity building, financial education and education to self-entrepreneurship, aimed in particular at encouraging the transition of companies towards the new frontiers of digital, green, circular economy and innovative supply chains. In addition, the project engineers and facilitates access to financial instruments such as microcredit, microfinance and, more generally, sustainable finance, as well as new public funding instruments, to provide businesses with the necessary financial support to make innovative investments.

ENM role in Digital transformation: ENM supports the digitalization of businesses through its ordinary activities, therefore through entrepreneurial microcredit and tutoring services. In particular, the activity of supporting the digitalization of businesses is carried out by ENM tutors within the ordinary process of financing and tutoring, also because an increasing number of businesses (both new and existing) are heading towards a process of digitalization and innovation of their business model.

<u>Secondary education</u>: ENM carries out, in collaboration with other institutional subjects, an intense activity aimed at developing the financial education of young and adult citizens. ENM has great experience in the field of financial training and education: since 2015, it has realized 5 editions, with a multiplicity of Universities and both telematic and in-presence manner, of the Advanced Training Course "Management of Microcredit", a training course that offers participants tools for knowledge and management of microcredit as well as ethical finance.

ENM role within the project: ENM will participate as an affiliate partner in Spoke n° 6 "Digital transformation and technology transfer" with a staff of 7 highly specialized and experienced professionals in the field of design and implementation of financial support, training and capacity building programs, in favour of SMEs and



relying on European, national and regional funds. Within the spoke 6, ENM will support the target in finding investments for their development, also through the promotions of microfinance tools. Moreover, ENM will foster networking between the target and investors.

National and international research collaborations

On July 14, 2020, the ENM entered into an agreement with the Ministry of University and Research aimed at implementing a structured action for the economic exploitation of knowledge, operating as a transmission belt between the world of research and the real economy, in particular for technology transfer to encourage widespread innovation. Also, to encourage the training of professionals in the field of microcredit, ENM has implemented a series of collaborations with various other bodies, including: the Ministry of Education, University and Research, the Employment Centre of Rome, La Sapienza University, Tor Vergata University and the Italian Society for International Organization. ENM has developed several collaborations through a relevant pool of projects: • Trapani MicroHub: the project, promoted by a partnership led by the Municipality of Trapani, intervenes on welfare policies and job creation in the Trapani area, identifying the needs of young people under 35 and migrants, carrying out financial education and accompaniment to self-entrepreneurship and activating microcredit programs and capacity building initiatives in favour of local PA operators, private social and economic and credit sector. • F.A.S.I. - "Training, Self-Entrepreneurship and Start-up for Legal Immigrants". • Yes I Start Up, to promote and support self-employment and self-entrepreneurship of young NEETs through training, preparation and accompaniment, aimed at access to the measure 7.2 of PON IOG -SELFIEmployment Fund. • "Integrated project for self-entrepreneurship" - Continuation and integration of the intervention "SELFIEmployment", to finance the start-up of entrepreneurial initiatives promoted by young NEETs, women and long-term unemployed. • Rete Sportelli AMICI, informative and orientation services provided by CPIA, Municipalities, ASL, CPI, CCIAA, dedicated to third-country nationals through an integrated path of "Capacity building" training and reorganization of management processes. • "IKSE -Innovative Keys for Social Entrepreneurship: Piloting for VET Providers Readiness Innovative practices in a digital era" for (i) the development of the capacity to implement online, blended and distance teaching and learning activities; (ii) the strengthening of digital pedagogical competencies of actors, professionals and endusers, enabling them to provide high quality inclusive digital education; (iii) the dissemination of the use and creation of new high-quality digital tools and content. • "ENTRNET - Develop a European Adult Network in the field of Entrepreneurship". • "PROCCS - Promoting entrepreneurship and access to finance in the Cultural and Creative Sector". • "Microcredit Project Roma Capitale" - support for micro-enterprises and individuals in a situation of fragility and temporary economic or social vulnerability". • "SIMPIL - Microcredit Information Desks and Entrepreneurial Paths for Legality". • "Microcredit Guarantee Fund Campania Region". "Awareness-raising actions for stakeholders, institutional and economic actors of the tourism supply chain in the Convergence regions through the promotion and dissemination of knowledge of microcredit and microfinance tools" (2015). ● "M.I.C.R.O. Migrants Ideas Converted into Real Opportunities" (2015-2017). ● "MICRO-WORK - Networking for microcredit and employment" (2015). • "MICROCREDITO DONNA" (2013-2016). • "Azione di sistema per il monitoraggio e la valutazione del microcredito in Italia" (2013-2015)". • "MICROCREDIT AND WORK SERVICES - System action for the promotion and creation of innovative operational tools for self-employment and micro-entrepreneurship" (2013-2014). • "Capacity building on microcredit financial tools: definition and testing of new skills and tools for the effective and efficient management of programs" (2012-2014). • "Monitoring the integration of labour policies with local development policies of production systems about Microcredit and Microfinance" (2010-2013).

B2.8) ENTOPAN INNOVATION

Previous experiences and scientific/entrepreneurial skills

Partner description: ENTOPAN INNOVATION (hereafter EI) is an incubator and accelerator that supports startups with environmental and socio-economic impact. EI is part of the Harmonic Innovation Hub, an innovative ecosystem to the Mediterranean area to develop digital transition and circular economy processes. EI has defined indicators of environmental and social impact with the support of the Human Foundation. EI has defined a scouting strategy to select startups with high technology able to develop positive environmental impacts.

Departments and expertise: Entopan Innovation has helped many ideas to become innovative startups and supported them in technology transfer and research enhancement activities.



Technology Transfer activities: Relevant TT programs involving EI are: • Innovare In Rete: a program that combined funding, investments and services to support technological and social innovation processes in the era of Digital Transformation. • Call for Italy: a program created to help and assist companies in overcoming the COVID-19 emergency with advisory and consultant services. • Call for the Economy of Francesco (CEF): a program to select innovative "Ideas" and "Projects", conceived in Calabria, and the best of them started an incubation path with consultancy services and other development support activities. • First Round: Call for ideas, promoted by Invitalia and Entopan Innovation, to support business development in Southern Italy through the incubation and acceleration of innovative ideas, products and services. • Impact Now: Entopan Innovation supported as a partner of Lica.co and national and international partners the tour "Impact Now" in seven Italian cities. Impact Now was an event tour dedicated to innovation and positive impact and social and sustainable entrepreneurship.

Project activities: Relevant initiatives involving EI cooperation in varying degrees are: • Seed per il Sud: Entopan Innovation is an accelerator of the CDP program that funded startup in the pre-seed/seed phase located in the South of Italy. • Digital Innovation Hub: Entopan Innovation has promoted and supported the activities related to the Digital Innovation Hub Calabria. • Rassegna TOUCH: Entopan Innovation organized some Meetings/Debates and Workshops dedicated to digital innovation about humanistic culture and the enhancement of the cultural and environmental heritage of the area. • Harmonic Innovation Week: event of technological and cultural contamination topics in social innovation and digital transformation organized with NTT Data, held from 16 to 20 September 2019, in Castrolibero, Calabria.

EI role in Digital transformation: Relevant initiatives on Digital Transformation are: • Harmonic Innovation Contes, a program to select projects in digital transformation. The program included an incubation period and the opportunity to participate in the Harmonic Innovation Week, an event of technological and cultural contamination, oriented to the themes of social innovation and digital transformation. • Human Tech: Open Innovation & Acceleration Program to support the Transition 5.0 processes of Social Cooperatives.

Secondary education: EI supported several training activities. Among others: • Master "Innovation and Industrial Development and Contest": advanced course for graduates, professionals and entrepreneurs related to Industry 4.0 and Digital Transformation. • OASI Academy: courses of the OASI school of innovation. The courses are focused on 3 training areas: innovation strategy; digital transformation for business; design and tool for digital development. • Social Media Courses: Fastweb Digital Academy and Entopan Innovation promoted free courses for young graduates and/or undergraduates in Social Media topics. The courses were carried out at the Department of Mechanical, Energy and Management Engineering of the University of Calabria. • Cybersecurity Course: 250 hours of specialized technical training, which involved n. 15 new graduates or undergraduates in STEM subjects. The course was promoted in partnership with RANDSTAD ITALIA. • Talent Camp: The Talent Camp is an innovative service that has the goal to facilitate the processes of identifying young talents by companies, through tailor-made training techniques and models, with a focus on emerging technologies.

ENTOPAN role within the project: EI will participate as an affiliate partner in Spoke n° 6 "Digital transformation and technology transfer". Entopan Innovation will involve 23 expertises with high skills in the field of technology transfer and valorisation of scientific research in the project activities. The team collaborates in research and development activities with PAs, universities, SMEs, innovative startups and private research centres in Italy. In the team, some experts have experience as mentors to several international acceleration programs. They have also been involved in supporting research organisations and SMEs in the field of technology transfer, open innovation processes and startup incubation. The team also has consolidated experience in supporting business startups and spinoffs. Entopan Innovation will support the SMEs, startups and spinoffs of the ecosystem in incubation and acceleration programs, open innovation activities and help them in managing relationships with investment funds.

National and international research collaborations

The most relevant national partnership are the following: • Fondazione Social Venture Giordano dell'Amore: the Italian Foundation aimed at the promotion of the impact investing culture, to facilitate social innovation. • Fondazione Giacomo Brodolini: it is a private and not-for-profit foundation developing, applying and disseminating evidence-based policy design, delivery and evaluation at all governance levels. • Fondazione Bruno Kessler (FBK): it is a research centre that operates in the scientific, technological and human sciences fields. • Invitalia: it is the National Agency for Inward Investment and Economic Development and it manages all national incentives that promote the creation of new companies and innovative startups. • CDP Venture



Capital Sgr: it is an asset management company that supports the creation of Programmes of Acceleration and Technology Transfer Hubs across the region, in the form of co-investment, for overall market growth.

B2.9) EPITECH GROUP

Previous experiences and scientific/entrepreneurial skills

Partner description: Epitech Group S.p.A, with a statutory seat in Milan, was founded in 2004 as an Srl company by pharmacologists who, starting from a significant experience in the field of lipid chemistry, have dedicated their activities to the identification, study and validation of pharmacological modulation mechanisms applied to the development, to the production and commercialization of advanced and innovative systems of therapeutic strategies aimed at preventing or slowing down the neuroinflammatory processes associated with rapid diseases. In 2015 Epitech was transformed into an S.p.A. and adopted a Quality Management System compliant with the international UNI EN ISO 9001: 2015 and UNI CEI EN ISO 13485: 2016 schemes. Since 18/01/2017 Epitech has been registered in the special section of innovative SMEs. Since 22/02/2017 Epitech has been included in the list of companies with a legality rating.

Involved departments and expertise: Epitech currently operates in 3 Operative Units located in Saccolongo (Padua), Naples, and Messina, Italy. The Operative Unit in Saccolongo is dedicated to Chemical Research and includes a synthetic organic laboratory, an analytical chemistry and materials characterization laboratory, and a formulation development laboratory. Its activities focus on the design, identification and chemical formulation/development of biologically active lipid molecules able to promote the resolution of inflammatory processes while counteracting the development of non-resolving neuroinflammation associated with chronic degenerative diseases of the peripheral and central nervous systems. The Unit occupies 100 square meters of space and is equipped with state-of-the-art instrumentation necessary for chemical research. A Clinical Research Unit is also based in Saccolongo which manages/coordinates all clinical trial projects carried out in fields linked to the Company's interests, in compliance with existing regulations and ethical requirements. The Naples and Messina Operative Units are involved in the development of Epitech's Preclinical Research projects. Laboratories are based in the Biomolecular Chemistry Institute, National Research Council in Pozzuoli (Naples), and in the Department of Environmental and Biological Sciences of Messina University. The Company has entered into 'purpose-built' agreements with these entities that provide for the availability of research laboratories and the presence of employees and independent contractors. The activities performed by these two Units are diversified and complementary. The Pozzuoli Unit is responsible for biological and chemical analyses and studies based mainly on the use of cell lines, while the Messina Unit is built around expertise in *in vivo* experimental models and primary cell culture systems and/or organotypic cultures. The experimental models applied in both Units are designed to identify and characterize in vitro and in vivo the pharmacological activity of molecules produced in the Saccolongo Unit. The research staff is formed by 7 PhD, 11 researchers with a Master's degree and 3 Laboratory technicians.

Technology Transfer activities: The company holds numerous industrial and intellectual property rights, the main ones filed since 2010 are: EP1844784 - A pharmaceutical composition for the treatment of pathologies caused by the general response of the immune system released in Italy, Austria, France, Germany, Greece, Spain, Sweden, Switzerland, Hong Kong (1110016), Japan (5253750) and Canada (CA 2582027); EP 2475352 - Composition containing ultra-micronized palmitoyl - ethanolamide released in Italy, Austria, Belgium, Cipro, France, Germany, Greece, Luxemburg, Netherland, Poland, Portugal, UK, Spain, Sweden, Switzerland with extension in the USA (US 8,470,373), Japan (5746178) and Australia (2009352080); US 8,546,352 released in the USA; 0001415028 released in Italy; 0001418820 released in Italy; EP 2821083 released in Europe.

Project activities: Previous projects in which Epitech was involved and relevant for the program objectives are: • Research and development of bioregulators active on epigenetic mechanisms of inflammatory processes in chronic and degenerative diseases (BIAM-EPI). Italian Ministry of Instruction, University and Research grant 2010 (MIUR; PON01-02512. Epitech: coordinator. (Innovative therapies for chronic inflammatory diseases, metabolic, neoplastic and geriatric, TIMING). PO FESR 2007-2013. Operative objective 2.1 – Campania Region. • Development of brain-targeted epigenetic drugs for the treatment of neurodegenerative disorders and brain ischemia. Project Code: RF-2010-2315142. Projects for Young Researchers – Italian Ministry of Instruction, University and Research grants 2010. • Serum lipidomics: a new tool to correlate skin and systemic lipid metabolism. Project Code: RF-2010-2316435 Projects Young Researchers – Italian Ministry of Instruction, University and Research grants 2010. • High-tech technologies for the production of nanocomposites for the treatment of neurodegenerative diseases with a high social impact. Incentives for industrial research and/or experimental development projects with the intervention of the Regional Law No 9





of 18 May 2007. Veneto region grants 2014. • Validation of an innovative therapeutic product for the management of primary chronic pain by limiting persistent inflammation and associated neuroinflammation (ProTIDol). PO FESR 2014/2020 -AZIONE 1.1.5 - D.D.G. n. 3527 del 15/11/2019 - Project n. 08ME2110000209 – Epitech: coordinator. • Svil MicroNanotecn per Predit, Diagn, Terapia e Tratt Rigen delle Alteraz Patol Osso e Osteo-Articol. PNR 2015-2020 Avviso n 1735 del 13 07 2017. Project ARS01_00693_ Prot.526_17apr20. • Technological development of CNS-active products through the regulation of the microbiota-endocannabinoid system axis. Fund for Sustainable Growth, aimed at supporting research and development projects in the technological areas identified for the Agrifood Call, MISE, 14-04-2020.

EPITECH role within the project. EPITECH will participate as an affiliate partner in Spoke n° 5 "Technologies for a healthy nutrition and resilient communities" with a staff of 9 highly specialized and experienced professionals in the field of new therapeutic strategies, drug biotechnologies, preclinical research, planning and management of clinical trials, diet and nutrition, technical manufacturing.

National and international research collaborations

EPITECH actively participates in initiatives aimed to foster clinical innovation in different areas: • Pharmacological screening of Epitech molecules in vitro and in vivo. Characterization of the mechanisms of action of active molecules in collaboration with the Department of Chemical, Biological, Pharmaceutical and Environmental Sciences, University of Messina. • Study of the endogenous role of N-acylethylamines (NAE). Lipidomic analysis. Evaluation of NAE biological activity in in vitro systems in collaboration with Istituto di Chimica Biomolecolare (ICB)- CNR. Pozzuoli. Napoli. • Study of the mechanisms of NAE in chronic pain processes in collaboration with Department of Experimental Medicine - University of Campania Luigi Vanvitelli. • Evaluation of the ability of NAEs to delay/reduce tolerance induced by morphine in collaboration with the Department of Neuroscience, Pharmaceutical and Child Health (NEUROFARBA) - University of Firenze. • Pharmacological studies of NAEs in *in vivo* models of chronic inflammation in collaboration with University of Naples Federico II - Department of Experimental Pharmacology, Faculty of Pharmacy. Pharmacological studies of NAEs in *in vivo* and *in vitro* Alzheimer's models in collaboration with the Sapienza University of Rome - Department of Physiology and Pharmacology.

Pharmacological studies of NAEs in in vitro models of primary glial cells in collaboration with the University of Padua, Department of Pharmaceutical Sciences. • Evaluation of the efficacy of NAEs in epilepsy models in collaboration with the Department of Health Sciences, University of Magna Græcia of Catanzaro.

B2.10) ISPRA

Previous experiences and scientific/entrepreneurial skills

Partner description: The Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA) is an Italian public research institute, established by Law No 133/2008, and supervised by the Ministry of Ecological Transition (MiTE). It was formally established in 2008 but has been operational since 2010, with Ministerial Decree No. 123 of 21 May 2010, which defined the merger into ISPRA of three bodies controlled by the Ministry of the Environment and Protection of Land and Sea: 1) The Agency for Environmental Protection and Technical Services (APAT); 2) The Central Institute for Scientific and Technological Research Applied to the Sea (ICRAM), with offices in Rome, Palermo, Chioggia, and Livorno; 3) The National Institute for Wild Fauna (INFS), with its headquarters in Ozzano dell'Emilia. The institute deals with environmental protection, including marine protection, environmental emergencies and research. ISPRA is also the guiding and coordinating organisation of the regional environmental protection agencies (ARPA) and cooperates with the European Environment Agency (EEA) and with national and international institutions and organisations operating in the field of environmental protection. With the entry into force, in 2017, of the National System for Environmental Protection, a network was created that merges the institute, the nineteen regional agencies (ARPA) and those of the two autonomous provinces (APPA), of which ISPRA has the coordination.

Departments and expertise: ISPRA, as the technical-scientific reference agency of MiTE for the implementation of environmental protection policies, acts as a representative of the competent authority in scientific and technical organs of international conventions and agreements (such as UNFCCC, CBD, UNCCD, IPBES, Barcelona Convention for the SPA-BD Protocol, IMO) and takes care of the integration of scientific knowledge in the national processes of definition and implementation of policies and strategies for nature and soil protection and the identification of the main developments in the field of nature and soil protection policies. ISPRA is the technical-scientific reference body of the Ministry for the implementation of Legislative Decree 190/2010 (Marine Strategy), Directive 92/43/EEC "Habitat" and for the procedures for the establishment of



new marine protected areas (MPA) and marine sites NATURA2000 of the high seas (beyond 12mn). According to the PTA 2022-2024 wich is consistent with the priorities of the NRP 2021-2027 and the Strategic Research Agenda of the European Union, the llines of research activities to the study of biodiversity are: • Development of innovative tools and technologies for observation, mapping and monitoring of marine biodiversity that can be implemented in the framework of institutional monitoring for the EU Marine Strategy Framework Directive and Habitats Directive, e.g. applications of omics sciences, studies of biological effects of contaminants and marine litter, to environmental monitoring of biodiversity and the spread of invasive non-native species; • Development and application of integrated assessment criteria, including ecotoxicogenomics, for the study of biological effects of anthropogenic impacts (contaminants and marine litter) and climate change on marine biodiversity; • Development of tools and methods for the analysis of cumulative impacts on marine biodiversity and trophic networks for the planning of conservation, restoration and regulatory measures, including for the achievement of Good Environmental Status, which is the exclusive responsibility of the MiTE (MSFD, EcAp Process), development of ecological models of "habitat suitability" also in relation to climate change; • Identification of indicators and development of methods for analysing the effectiveness of ecological restoration interventions in marine and transitional environments, in synergy with the activities of the PNRR MER project, of which ISPRA is the implementing party; • Innovative approaches for the protection of biodiversity in fisheries and resource management; • Development of methods and operational tools for the assessment and containment of the impacts of aquaculture (Legislative Decree 152/2006 Art. 111) on biodiversity and marine ecosystems and the maintenance of ecosystem services.

<u>Secondary education</u>: ISPRA promotes and develops education and training programs of environmental themes at national and international levels, through the following activities: 1) Environmental education projects and initiatives; 2) Planning and organization of environmental training courses both in a classroom than e-learning, also to support national and international projects; 3) Internship for the environmental training; 4) Coordination of the Interagency working group for the Education oriented to sustainability and Interagency working group for the Permanent Training.

ISPRA role within the project: ISPRA will participate as an affiliate partner in Spoke n° 2 "Technologies to reduce energy consumption and save biodiversity" through 1 Department (BIO-DIR) involving 7 researchers with expertise covering several relevant fields including: marine biodiversity, environmental protection, marine geophysics, marine robotics, underwater photogrammetry, machine/deep learning. ISPRA will capitalize on several European and National projects that have been implemented by staff in the past years on spoke themes including: The Marine Strategy Framework Directive (MSFD-2008/56/EC) and the Habitats Directive Natura 2000 sites and the Barcelona Convention, EMODNET; SEA FOREST LIFE.

National and international research collaborations

Relevant collaborations within national and international projects are: **ICAT** Grant Agreement UNOPS/ISPRA in support of ICAT "Initiative to Support Monitoring, Reporting and Verification for National and Sub-national Climate Change Policies and Evaluating Sustainable Development Benefits Generated by their Activities" (Grant no. 972223_2018_02); **VERIFY**: Observation-based system for monitoring and verification of greenhouse gases (H2020 Grant Agreement ID: 776810); **AdriaClim** - Climate change information, monitoring, and management tools for adaptation strategies in Adriatic coastal - - Interreg Italia-Croazia; **EMODNET** Geology - Operation, development and maintenance of a European marine observation and data network - [Contract no. EASME/EMFF/2016/1.3.1.2- Lot 1/812.750862]; **ECAP-MED II** - Mediterranean implementation of the Ecosystem Approach, in coherence with the EU Marine Strategy Framework Directive (MSFD) (Agreement no. UNEP/PCA/DEPI/2016/FMEB-MAP/017); **SEA FOREST LIFE** - Posidonia meadows as carbon sinks of the Mediterranean (LIFE17 CCM/IT/000121); **CHANGE WE CARE**: Climate change adaptation measures in coastal areas (Interreg Italia-Croazia); **NI** Natural Intelligence for robotic monitoring of habitats (H2020 Grant Agreement number: 101016970).

B2.11) NTT DATA

Previous experiences and scientific/entrepreneurial skills

Partner description: NTT DATA, Trusted Global Innovator, is the Innovation Partner of IT solutions for clients located around the world. NTT DATA ensures innovative IT services to the Customers by focusing on long-term commitment and by combining global reach and local intimacy to provide premier professional services from consulting, system development to business IT outsourcing. NTT DATA Italia is part of the NTT DATA Group, headquartered in Tokyo, NTT DATA, with more than 120,000 professionals and operating in 50



Ministero dell'Università e della Ricerca

Countries by offering IT services spanning applications, infrastructures, network, cloud, and industry solutions. For over a year now, NTT DATA has activated a Sustainability practice, which produces value propositions for the various sectors in which it operates, and contributes to the work of the Green Software Foundation by proposing 360-degree solutions for reducing the environmental impact of activities related to production and operation of digital systems. NTT DATA also works on the design and development of a platform aimed at monitoring carbon flows, based on the use of sensors distributed in wood areas together with IoT and AI technologies for data collection, processing and management, and with Blockchain technology to notarize the measured values.

Departments and expertise: NTT DATA Italia employs more than 5,000 professionals and operates as a valueadded system integrator, with a strong focus on innovative technologies, leveraging in-house teams with deep skills in AI, IoT, Blockchain, XR, Cybersecurity as well as in more traditional technologies, cooperating with more than 250 innovative startups / PMIs and with about 20 universities and research centres.

<u>Technology Transfer activities:</u> For many years NTT DATA has been active in the technology transfer matter, thanks to the adoption of Open Innovation methodologies through which it consolidates its collaboration with universities, research centres, accelerators and incubators, startups and innovative SMEs. Through its Open Innovation Contest, NTT DATA Italia allows innovative startups to present innovative proposals to their customers, solving real business needs.

Project activities: NTT DATA Italia also collaborates with innovative startups in the creation and application of solutions aimed at reducing the environmental impact, providing a free platform to allow startups to convey their offer to the appropriate sectors, with the support of NTT DATA professional services and solutions. Thanks to its Open Innovation programmes, NTT DATA realizes Proof of Concept aimed at validating the solutions and technologies before bringing them to the market, selecting the most promising ones and significantly improving the yield of the projects in the field. The NTT DATA Open Innovation network concerns all the companies of the group, which collaborate through knowledge exchange and funding programmes, and involves all players of the innovation ecosystem (startups, innovative SMEs, universities, research centres, accelerators and incubators) with partnership programs and collaborations aimed at mutual sustainability and growth. Relevant projects carried out by NNT DATA are (among others): 1) Creation of a system for the management of a fleet of electric bikes, including a mobile app for rental and operation, back-end services for the management of vehicles and interaction with users, integration with payment systems and ERP, integration with services for the use of the territory. 2) Creation of a solution for the management of electric car charging columns, including a mobile app for charging/reporting problems, back-end services for managing columns and interacting with users, integration with payment systems and ERP; 3) Creation of solutions for the management of a smart city (Las Vegas), including services for citizens, management and monitoring services for merchants and law enforcement agencies, environmental monitoring.

NTT DATA role in Digital transformation: as a system integrator, NTT DATA has always been at the heart of digital transformation, which it pursues through a process that starts from the analysis of the needs of endusers and designs human-centric solutions. Thanks to its design studio named Tangity, which is present in Italy as well as in multiple countries in which the company is most active, NTT DATA designs user experiences, user interfaces and interaction flows, which are then transformed into applications enjoyable through fixed and mobile devices, as well as back-end services, which are integrated with end-customer systems. NTT DATA is at the centre of various digital transformation solutions, which concern the most disparate sectors such as art and culture (digitization of the Vatican Library, creation of solutions based on augmented reality for museums, etc.), the sectors of " Energy, Industrial Manufacturing, Telecommunications, Commerce, Insurance, Credit Institutions and Public Administration.

<u>Secondary school:</u> NTT DATA participates in education programmes by running training university and high school courses through its qualified staff. In addition, NTT DATA labs host students who need to work on graduation/doctorate thesis, providing the tools and skills necessary to perform the activity in the best possible way and laying the foundations for a successful debut into the working arena

<u>NTT DATA role within the project</u>: NTT DATA will participate as an affiliate partner in Spoke n° 6 "Digital transformation and technology transfer" through 7 researchers working on ICT system integrators and skilled in data mining, machine learning, etc. NTT DATA will capitalize on several National and Regional project including the: • Development of a solution for the monitoring of carbon flows generated by wood areas, using specific sensors and notarizing the measured data, in collaboration with the Calabria Region and the National Research Council; • Development of methodologies for measuring the energy consumption related to the



Ministero dell'Università e della Ricerca

creation and use of IT solutions, in collaboration with the Green Software Foundation; Set-up of a laboratory for the creation of innovative systems in the field of forest, land and environmental management, in collaboration with the Calabria Region and the University of Calabria; • Creation of a platform for the monitoring of the individual systems enabling mobility (road networks, traffic lights, charging columns, service stations, traffic, ...), the management of simulations based on monitored data (for example, what happens to the traffic of the road network of the monitored area if the viability in a given area is interrupted) and the provision of smart mobility services to citizens and local administrations

National and international research collaborations

NTT DATA regularly collaborates with the different players involved in the supply chain concerning the creation of complex systems. NTT DATA interacts with customers, private or public, to characterize the object of the required implementation, developing use cases centred on the different types of users which must be served. On this basis, NTT DATA establishes the functional architecture, the internal and external interfaces and the interaction flows of the system to be created, collaborating with universities and research bodies according to the specific aspects of the implementation context. The company then moves on to identify the technological components that best suit the needs, leveraging the collaboration with innovative startups and SMEs, as well as on their asset and service base, for the components which are not easily found on the mainstream market, then completing the implementation through agile cycles / continuous integration.

B2.12) RINA Consulting - CSM

Previous experiences and scientific/entrepreneurial skills

Partner description: Rina Consulting - Materials Development Center (CSM) (hereafter also RINA) was founded in 1963 on the initiative of the major Italian steel and mechanical industries. The company is equipped with specialized laboratories and operating units of particular importance for the execution of technical/scientific activities, and in particular of complex tests and experiments. CSM also operates with a matrix structure that dynamically intersects the activities and responsibilities of the Business Areas, customer management and market development, with those of Competence Centers. The Business Areas are responsible for managing the relationship with the customer and for business development, the Competence Centers for updating and developing resources and their optimized use according to the business needs to be expressed by the business areas. In January 2014, CSM became part of the RINA Group, which became its sole shareholder in 2015. RINA provides verification, certification, naval classification, testing of products, supplier qualification, engineering consultancy and training. RINA has years' experience in sustainability and lowcarbon energy, resilience and critical infrastructure, industrial technologies and materials, smart cities, digital technologies, space technologies, sustainable transport, blue economy, circular economy, due diligence, energy yield & resource analysis, environmental and social services, feasibility & development, grid connection support, operational performance analysis, owner's/Lenders' engineering, technical component reviews, energy storage services.

Departments and expertise: The skills and equipment available allow the company to develop projects internally. All phases of R&D projects including simulations, processing, preparation and analysis of samples and mock-ups and all testing phases take place within its facilities. Researchers have a broad view of possible solutions also thanks to the network of relationships and collaborations with universities and public and private research bodies at the national and international levels. In addition, in recent years the Company has equipped itself with a new complex of laboratory systems for Surface Engineering in Lamezia Terme (analysis and characterization of surfaces using techniques such as GDOES, Hall effect measurement and test benches, coating techniques using cold spray and sol-gel) and a laboratory dedicated to testing materials and vessels for the storage of hydrogen up to 1000 bar. Its main research activities are related to: a) innovative materials and components with interventions aimed at the development of diversified materials (such as special and construction steels, superalloys, intermetallic compounds, metal matrix composites, refractories and technical ceramics), related manufacturing, transformation and use (e.g. prototyping, forming, welding, surface treatments and coatings, etc.); b) the steel industry with interventions extended to the entire manufacturing cycle in the area of primary processes (steel mill and continuous casting), transformation (rolling, forging, coating, etc.), in the development of steels for diversified uses (sheet metal and welded tubes, seamless tubes and mechanical products, etc.); c) the understanding of the elementary mechanisms of behavior of materials and of control and regulation of the processes that they undergo in the various phases of the production cycle, through the development of adequate forecasting tools and dedicated modeling. d) diversified activities of calculation,



stress analysis, testing and engineering etc. e) the environmental field, aimed at studying the problems of pollution and safety, at the development of new "clean" processes, both through process and system innovations and through the optimization of the management of existing plants.

International scientific recognitions: The CSM, thanks to the wide and consolidated wealth of knowledge in technologies and methodologies for the design, manufacture, finishing and application of components in steel, special alloys, ceramic materials and other special materials, is perceived by industrial companies as an organism national reference for innovation in the field of production and use of special materials and components. CSM is the first subject in terms of the number of researches won in the various European calls (Research Fund for Coal and Steel, RFCS, Horizon 2020, Spire, etc.), collaborating with all the main European research centres, institutes, universities and industrial entities; for its recognized excellence in steel research, it participates in all European initiatives and committees in the sector (RFCS, European Steelmaking Technology Platform, ESTEP, Research Initiative for European Steel, RIES, etc.).

<u>Technology Transfer activities:</u> Internally and with its financial and logistical support, CSM finds a way to capitalize on its basic knowledge, its over 800 patents and the innovative processes it has developed, from the management of industrial waste to energy to the development of pipelines. The CSM operates exclusively on contract with strong attention to confidentiality and safeguarding the ownership of the results developed for the client.

<u>Project activities:</u> The CSM is recognized as an important node of the European network of research and innovation that operates for the industrial sector of steel production and diversified sectors, such as oil and gas, aerospace, materials and special products, engineering and plant engineering and the environment and energy, in collaboration with large, medium and small companies, both manufacturing and engineering.

<u>RINA</u> role within the project: RINA participates as an affiliate partner in Spoke <u>n°</u> 2 "Technologies to reduce energy consumption and save biodiversity" through the premise located in Lamezia Terme by involving 10 researchers with expertise covering several relevant fields related to the project including surface engineering and additive manufacturing, hydrogen embrittlement, microstructural and Metallurgical Characterization of Cold Spray Coatings, Synthesis and characterization of Functional Coatings for gas storage and distribution, Development of innovative coating materials, Programming of numerical controlled machines. RINA will capitalize on several European and National projects that have been implemented by the staff in the past years about the topics of the spoke including PON EOMAT; H2020 EVERYWH2ERE; FP7-JTI MATHRYCE; FP6-SUSTDEV NATURALHY.

National and international research collaborations

Completed R&D collaborative projects: • H2SusBuild Development of a clean and energy self-sustained building in the vision of integrating H2 economy with renewable energy sources, 2008-2012 - Key partners: RINA Consulting, Ntua, Acciona, Ici Caldaie, Dnv Gl; • H2OCEAN Development of a wind-wave power opensea platform equipped for hydrogen generation with support for multiple users of energy, 2012-2014 – Key partners: Aws Truepower, Rina Consulting, Fraunhofer, Dtu, Treelogic, Cranfield University; • NATURALHY Preparing for the hydrogen economy by using the existing natural gas system as a catalyst, 2004-2009 - Key partners: Nederlandse Gasunie, Rina CSM, Statoil, Shell Hydrogen B.V., Total, Tno, Cea; • MATHRYCE Material Testing and Recommendations for Hydrogen Components under fatigue, 2012-2015 - Key partners: Cea, Air Liquide, Jrc, Rina Csm, Dalmine; • HITHER Development of Cr-Mo-V ferritic steels for high temperature steels for high temperature hydroprocessing reactors with enhanced behaviour, 2000-2003 - Key partners: Rina CSM; • EOMAT Innovative systems and materials for the production and storage of Renewables, 2015-2017 - RINA CSM. Ongoing R&D projects: • EVERYWH2ERE Development and demonstration of innovative fuel cell "plug and play" transportable gensets, overcoming traditional gensets by providing zero noise/zero emissions and to be tested in construction sites, music festivals and urban public events all around Europe, 2018-2023 – Key partners: RINA Consulting, Vtt, Environment Park, Linde, Acciona; ● FLEXNCONFU It will design and demonstrate in a real power plant how to flexibilize a Combined Cycle (in Ribatejo, Portugal, managed by EDP) thanks to Power-to-X-to-Power solutions based on hydrogen and ammonia. Innovative Gas Turbine and management solutions for hydrogen/ammonia operation will be demonstrated as well, 2020-2024 – Key partners: RINA Consulting, Unige, Tirreno Power, Edp - Gestao Da Producao De Energia, Hydrogenics Europe, Nuovo Pignone, European Turbine Network, Fundacion Circe; • IANOS Demonstration of a 2MWe Electrolyzer and development of hydrogen-fuelled 12-person water taxis, with hydrogen supplied by the electrolyser. Production of a digester improved by adding an excess of H2 (produced by the Electrolyzer) for the production of green CH4 to be injected in the existing NG network, 2020-





2024 – Key partners: Edp, RINA Consulting, Certh, Tno, Engineering, Efacec, Municipality of Ameland; • TECBIA Development of zero-emission energy generation systems for naval applications, exploiting hydrogen technologies and battery electric accumulators, 2018-2021 – Key partners: Fincantieri, Rina Services, Cetena;
• THOR Thermoplastic Hydrogen tanks Optimised and Recyclable, 2019-2022 – Key partners: Faurecia, Air Liquide, RINA CSM, Sirris, Ntnu, Cetim, Cnrs; • STORIES Storage Research Infrastructure Ecosystem, 2022-2025 – Key partners: Kit, Ait, Ciemat, Ic Belgium, Cnr, Eni, Edf, Sintef, RINA CSM.

B2.13) TECHFEM

Previous experiences and scientific/entrepreneurial skills

Partner description: TECHFEM S.p.A. was founded in 1984 by a group of professionals and managers from Snamprogetti S.p.A. The attitude of the founders at developing customized design solutions for the operation and production plants issues of their clients, and the passion for research and development, contributed to laying the foundation for a company customer-oriented and technological innovation-driven. Nowadays, Techfem is an independent engineering and construction services provider with offices in several strategic locations in Italy and branches abroad. The particular attitude to solve complex engineering issues and the attention to technological innovation allowed Techfem to be an engineering and consulting company operating today in several diverse fields of the oil & gas sector, ranging from upstream to midstream and downstream. The two main offices are Fano (PU) and Lamezia Terme (CZ). In the energy transition, one of the principal task pillars in which Techfem is involved concerns the definition of energy models: Techfem is contributing to the definition of a new energy paradigm as Hydrogen Valleys. In its vision and feasibility studies, the hydrogen valleys could encourage the penetration of circularity processes in hydrogen production, from waste valorization to the sewage water recovery for the electrolysis process. Techfem is pursuing an important investment plan in research and development based on four macro guidelines, i.e. Hydrogen Economy, Energy Storage, Digitalization and Circular Economy, aimed at the syngas production, and, in turn, at the innovative production and storage of hydrogen to massively contribute to the decarbonization program.

Involved departments and expertise: Engineers, researchers and technologists at Techfem have gained great experience in dealing with multidisciplinary engineering projects over the years, with a particular focus on process design, HSE evaluation and digital automation. They apply a multidisciplinary approach through the entire development and production lifecycle, from feasibility studies through the construction phase up to final decommissioning. They have been involved in numerous projects from the conceptual and design phase to the final pre-commissioning and start-up phase, passing by the construction stage. This means they have acquired the experience and the resources to know exactly when – and exactly how – to address the technical challenges of an R&D project. They develop the concept, engineer the scope, manage the risks and establish project cost and schedule. The Techfem process team is mainly dedicated to supplying engineering services in fluids and multiphase mixtures handling, storage, and transportation. Techfeam has specific knowledge in advanced technologies like multiphase flows of two-or three-phase mixtures, always present in gas and oil upstream gathering systems, and non-Newtonian fluids usually encountered in the solid-liquid mixtures (i.e. coal pipelines or oil-water emulsions).

Project activities: The R&D department is very experienced in national and international co-operations with customers and other University research departments. Projects in the waste-to-gas sector have been conducted, with particular focus on the computational fluid dynamics simulation and the design of pyro-gasification of organic wastes. Relevant ongoing research projects are related to: 1) Waste-to-gas processes for the valorisation of wet biomass by supercritical water gasification (supported by Italian Ministry of Education and Research); 2) Design and simulation of H2 production and innovative storage coupled to building information modelling and digital twin technology; 3) Experimental activities and process development of CO2 capture technology through mineralization. In the circular economy sector, and in particular, in the design of innovative processes, Techfem contributed to the development of an innovative method for the energetic valorisation of municipal solid waste (MSW) through pyrolysis with electromagnetic induction technology. The MSW fraction treated was retained during the sieving pre-treatment operation to separate the organic fraction intended for the anaerobic digestion producing advanced biofuel. The study has been conducted by computational fluid dynamic (CFD) simulations, which allowed us to optimise the geometry, to analyse the heat distribution within the reactor, guaranteeing more flexibility in the high variability of input material to be treated. Experiments on a laboratory scale reactor were also carried out to validate the CFD model results. Techfem developed an innovative procedure for the storage of natural gas based on adsorption at low pressure. The storage of natural gas in the physically adsorbed state (ANG) at 35 bar presented energy densities comparable to natural gas



compressed (CNG) at 250 bar. In the field of CO2 capture and utilization, Techfem is developing an innovative procedure based on the mineralization of CO2.

<u>Techfem role in Digital transformation</u>: Several projects focused on a) the digitalization for the production processes of the engineering activities of Techfem S.p.A. using custom-built software (supported by the Italian Ministry of Economic Development's initiative "Smart Factory"); and b) the digitalization of the monitoring activities for methane pipelines to reduce the risks related to the geomorphological structure of the crossed ground (this activity was supported by the Calabria Region under the PON initiative). Moreover, Techfem is developing an innovative digital platform for the design and management of pipelines and plants in the oil&gas sector, called the PIM platform. With the advent of hydrogen networks, PIM could be the ideal tool to identify optimal corridors for new pipelines, while libraries of analytics and remote IoT sensing available in the PIM platform could be used to make networks maintenance more digital and efficient.

Secondary school: Techfem promotes apprenticeships and internships for students and undergraduates and postgraduate training through various agreements in place.

<u>Techfem role within the project</u>: TechFem participates as an affiliate partner in the Spoke n° 2 "Technologies to reduce energy consumption and save biodiversity" through the premise located in Lamezia Terme (CZ) and by involving 9 researchers with expertise in Computational Fluid Dynamics, Finite Element Method Analysis, Development of Green Hydrogen projects, Development of Plant/Pipeline integrity, Technical Safety, Management system, Agrophotovoltaic System; Green Hydrogen Production and Utilization. The team can develop customized design solutions for the operation and production plants. Techfem SpA will capitalize on several European and National projects that have been implemented by the staff in the past years about the topics of the spoke including: PON 2017 Project ARS01_00868 "WWGF – Wet Organic Waste Gasification with Supercritical Water for Biomethane and LNG Production".

National and international research collaborations

Ongoing R&D projects: Wet Waste to Green Fuel (WW-Green Fuel) Development and demonstration of innovative process based on supercritical water gasification of organic wastes for biomethane - GNL; 2021-2023 - Key partner: Ditne, Enea, CNR-ITAE, Unical, University of Bari, University of Torino, Calabra Maceri, Techfem S.p.A., SOL S.p.A.; Synreattore Development of an innovative method for the energetic valorization of municipal solid waste (MSW) through pyrolysis with electromagnetic induction technology, 2019-2023 -Key partner: Calabra Maceri S.P.A., Technology Consultant: Techfem S.p.A.; Gas Low-pressure Storage Techfem S.p.A. is designing and developing a pilot-scale plant in the Calabria region aimed at the production, separation and storage at low pressure of Natural Gas and Hydrogen. The project is financed with internal company funds. The research equipment of Techfem S.p.A. is owned by the company itself, 2021-2022 - Key Partner: Techfem S.p.A.; Technology Consultant: Unical; CO2 Mineralization Techfem S.p.A. is designing and developing an innovative process aimed at carbon capture. The project is financed with internal company funds. The research equipment of Techfem S.p.A. is owned by the company itself; 2021-2022 - Key Partner: Techfem S.p.A.; Technology Consultant: Uni-Sapienza; PPIM (Pipeline, Plant Integrity management) Development and implementation of an innovative methodology and software platform to support technical divisions involved in pre-feasibility and feasibility studies for the design of new utility network infrastructures and asset monitoring during operation by combining offline and real-time data with advanced engineering analysis; 2020-2022 - Key Partner: Techfem S.p.A., Applicon S.r.l., Unical.

B2.14) TIM

Previous experiences and scientific/entrepreneurial skills

description: TIM, the leading telecommunications Partner operator in Italy (https://www.gruppotim.it/en.html), and more generally TIM Group operates in all sectors of the advanced electronic communications chain, with highly developed business in different fields such as fixed-mobile communications and the Internet, the office & system solutions (Olivetti), research and development (TIM Innovation Labs), the cloud (Noovle), Worldwide Global Operator (Sparkle) and Cybersecurity (Telsy). Since 2020 TIM has been putting sustainable development at the heart of its long term strategy by fixing environmental, social and governance goals and integrating them with the targets of its 2021-2023 Industrial Plan. The projects TIM brings forward to reach these goals contribute to achieving 11 out of the 17 Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda. TIM in the Industrial Plan, TIM defines with great detail its objective for fighting climate change and developing circular economy, in particular: a) Using 100% renewable energy by 2025; b) Eliminate indirect emissions (Scope 2) by 2025; c) Improving our eco-



efficiency by 50% within 2025, using Fiber and 5G; d) Enriching our sustainable products and services portfolio (+15% green smartphones) by 2024; Heading towards Carbon Neutrality by 2030.

Departments and expertise: The work carried out by TIM's R&D Departments is the outcome of a strategic partnership with the main manufacturers of telecommunications equipment and systems, as well as with centres of excellence in research at the most highly qualified national and international academic institutions. At the international level, TIM pledges a substantial commitment to the task of standardization and has been involved from the beginning in the European Union Framework Programmes.

Projects activities: The first 5G Open RAN connection on 3.7 GHz frequencies have been established in the TIM Innovation Lab in Turin. The new network that accelerates the development of digital services to benefit citizens and businesses has been activated in Matera. Different innovative solutions and prototypes were transformed into business propositions and commercial opportunities for TIM, including CitySensing (a platform for managing large events in urban areas based on the collection of Big Data from social media and mobile networks), Cloud Robotics and Virgil (solutions involving drones and remote presence robots connected through the TIM 4G network), Internet of Things systems, including Smart Agriculture (developed with Olivetti).

Technology Transfer activities: TIM is one of the top 10 companies in Italy for European patents granted every year and TIM's patent portfolio overcomes more than 3,000 patents. To maximize their value, a spin-up model was recently developed, that is the launch of start-ups that have received assets and the rights to use patents in exchange for equity options. Since 2013, the TIM #Wcap start-ups have launched over 50 go-tomarket activities within TIM, thanks to which turnover was generated. TIM #Wcap is indeed the business accelerator of the TIM Group that each year selects, finances and accelerates digital start-ups. From 2009 to date, more than 9,000 business ideas have been received and examined and approximately 300 projects have been selected and supported, to which 6.6 million euros were assigned to facilitate their development. The survival rate of the TIM #Wcap start-ups is over 90%. Starting with TIM #Wcap, TIM debuted in venture capital in 2014 launching TIM Ventures, the Group company created to invest in the share capital of the most innovative start-ups in all the sectors of strategic interest for the Company. In just over two years of business, TIM Ventures has invested in 14 start-ups (12 of which came from TIM #WCap) and was mentioned as one of the most active Corporate Venture Capital investors at the global level in 2015 by CB Insights. Following on from the acceleration and investment activities carried out in recent years, in June 2016, TIM was ranked by Fondazione Nesta and Startup Europe Partnership in 7th place among the 25 European companies (it was the only Italian one) that "dialogue" best with start-ups.

<u>**TIM role in Digital transformation:**</u> Thanks to advanced technological capacities, TIM Group can contribute to the development of new markets and new business areas: it deploys technologically advanced networks, widely distributed infrastructures and integrated platforms, to provide customers with advanced, innovative solutions, and provide access to new ways of communication.

Secondary school: Under the scope of the relationship with universities, in the last four years 133 PhDs have been financed, sponsoring first level masters' degrees at the Scuola Superiore Sant'Anna di Pisa (Management, Innovation and Engineering of Services and Digital Life & Smart Living) and Tor Vergata University (Big Data in business), and the TIM Chair in Market Innovation at Milan's Bocconi University.

<u>TIM role within the project</u>: TIM will participate as an affiliate partner in Spoke n° 3 "Smart technologies for sustainable agri-food chain and forestry" involving 7 experts in Learning Management, Project Management, Network Automation, Cloud Computing, Big Data Analytics to design solutions for the industrial and agricultural plant in a 4.0 business model. TIM will capitalize among others on the project related to the experimental development of 5G services with 14 active partners in the vertical markets of industrial automation and robotics, port logistics and smart agriculture.

National and international research collaborations

TIM actively participates in national and international initiatives aimed to foster innovation in different areas: Cognitive Computing: an important collaboration agreement has been signed with IBM, which makes the cognitive computing platform, called "IBM Watson", available to the Group. Cognitive computing is a branch of computing that aims to equip machines with the capacity to reason and naturally interact with humans. The operative projects aim to develop two chatbots that guide clients towards the solution of technical problems connected with Fibre, in one case and a more suitable response to queries on mobile offers, in the other. \bullet e-Commerce: in a partnership with Amazon, an innovative business model has been developed, which optimises the "proximity" asset intended as the capacity to "reach" the client. In this case, the collaboration is based on a





shared remuneration with the partner, the reason for which this partnership is considered an important example of the Group's entrance into the value chain of an OTT1. • Participation in "The Next Nest" project2: the Group has designed the interactive component of the work, developing a digital abstraction of a canvas by Daniele Gallian, on display at "The Next Nest" exhibition open from April to September 2016 as part of the XXI International Exhibition of the Milan Triennale, which allows visitors to interact in a gestural manner, creating new digital versions of the work that are unique and unrepeatable, downloadable thereafter from the installation site. • Big Data: along this route of Open Innovation and Evolution, the Group has started an evolutionary path based on several design "sites". Within these sites, various initiatives were launched in 2015 and completed in 2016, with the development of the first "internal" applications (aimed at improving the Customer Experience), the launch of the first services for the Business market on anonymous data, the start-up of the TIM Competence Center that will aim to train the internal competencies and scout and search for new Big Data technologies and applications, working in an open logic with the industry's main players. Moreover, in 2016, additional initiatives were also started, aimed in particular at aggregating different industry players and managers of large quantities of data to construct data partnership models to develop innovative applications intended for both digital cities (LivingLab project with Turin municipality) and to create innovative services to support private businesses in different fields (e.g. from the insurance world to that of the connected car). • In March 2018 TIM, together with Fastweb and Huawei, signed a memorandum of understanding with the municipalities of Bari and Matera for full 5G coverage by 2019, with 10 application areas launched and over 70 use scenarios. The investment is for over 60 million euros over 4 years and involves 52 partners (7 universities and research centres, 11 public administration bodies, 22 companies based in Apulia and Basilicata, 12 leading companies in the sector and start-ups). The application areas range from media and virtual reality (distribution and video contribution) to smart port (logistic security) and smart city (monitoring and transport); from smart agriculture (precision farming) to public safety (population safety and law enforcement support) and from healthcare 5.0 (remote diagnostics, hospital e-learning) to mobility and road safety (assisted driving and logistics).

B2.15) UNIBAS

Previous experiences and scientific/entrepreneurial skills

Partner description. The University of Basilicata with 6 primary structures between Schools and Departments as well as the School of Specialization in Archeology, 6 PhD schools (one of which in agreement with the University of Salento), has 321 between researchers and professors as well as 280 units of technical administrative staff and about 6,500 students. All the activities are carried out adopting a strategic focus, i.e. the culture of sustainability. The university campus of Potenza aims, in the short term, to self-sufficiency in terms of energy use reducing the environmental impact as much as possible.

Technology Transfer activities: In the last 10 years, Unibas carried out technology transfer activities hosting 14 spin-offs and with the publication of 9 patents. The working group has created a Spin-off named "Geospazio Italia s.r.l." that also works on the themes of the project. Unibas incubates Svelto! a spin-off of the data-management group at the Department of Mathematics, Computer Science and Economics. Svelto! is specialized in big-data management, data analytics, machine learning, and tailor-made software development. Svelto! was selected as one of the most promising Italian startups of 2021 by Digitalic, a magazine specialized in innovation, technology, business and design. GO OrtofruttaBasilicata - TInnoGePra - "Technological transfer of management innovations of agricultural practices in fruit and vegetable ecosystems" - 16.1 Rural Development Programs Basilicata 2014-2020.

<u>**Project activities:**</u> International and national projects/collaborations proposed or already existing have been included in the different spokes in which the university is involved.

<u>Secondary education</u>: Unibas promotes the development of joint teaching and research activities and favours the exchange of staff and students, through the establishment, increase and consolidation of institutional relationships with numerous universities and research institutes/organizations/centres at the national and international level. To date, Unibas has 134 international cooperation framework agreements and 187 international cooperation agreements for the mobility of students, professors and technical-administrative staff, in the Erasmus Project.

<u>UNIBAS</u> role in Digital transformation: In recent years, the University has carried out a digital transformation by ensuring that any services dedicated to students work on a digital system, (e.g. Student app: consultation of career information, booking exams, compilation of the didactic evaluation questionnaires, etc.); also for university staff (prof., researchers, technical administrative). Platform for Graduates Job placement is implemented. Other services regard the tools for payments and dematerialisations, the attendance cards.



Ministero dell'Università e della Ricerca

Activation of Open Data Portal; automated procedure for the management of public exams; open Badges for digital certification relating to soft skills for students; activation of cloud services for students and staff on the Google Workspace platform; management of bookings for face-to-face lessons and green pass control; functionalization of all classrooms for lessons in mixed mode. For the University Central Library: activated all remote access to all the BCA catalogues of analogue and digital resources. Finally, a digital management system was implemented for all the buildings, technical installations, spaces and all the inventories inside the university. **UNIBAS role within the project:** UNIBAS will coordinate the Spoke n° 4 "Technologies for a resilient and accessible cultural and natural heritage" and participate through 6 Departments and Schools (DICEM, DIS, DISU, DIMIE SAFE, SI), by involving 77 researchers with expertise covering several relevant fields including: Agritech, Archeology, Architecture, Anthropology, Arts, Chemistry, Entomology, Geology, History, Literature, etc. UNIBAS will capitalize on several EU and National projects including: MUR-PRIN (Literature 2015, Anthropology 2017), MISE-CTEMT, INTERREG-ECO-CICLE (ongoing), PON-MITIGO (ongoing), INTERREG-INNOVAGRO (2020), MIUR-SMART CITIES and COMMUNITIES & Social Innovation SCN_00520 (2019); EU Creative Europe Program-CREATIVE LENSES (2019), SMART CULTURE AND TOURISM - sMArTERA, SMART BASILICATA (2018). UNIBAS will use labs of the Research Infrastructures IRPAC (research infrastructure upgrade project: Technological and research infrastructure for the study of the past, conservation and management of cultural heritage). Specific and relevant previous Research projects are: PON-RESO, PON-DiABasi (ongoing), PON-DiLiBas (ongoing), PON-CHORA (ongoing). UNIBAS will also participate as an affiliate partner in the following Spokes:

Spoke n°1 "Circular technologies to mitigate geo-hydrogeological and forest fire risk": 24 researchers and professors are involved in the project with excellent competencies in basic and applied research on landslides and floods, and in the field of fire prevention with advanced remote sensing techniques. Relevant projects in the field of Spoke n°1 include: "Functional Center of Basilicata", for which UNIBAS has supported the Basilicata Region Civil Protection, and as well as numerous activities of study and research, commissioned by Interregional Authority of Basilicata Basin, in the field of flood risk mapping, assessment and management of main Basilicata rivers. A scientific consultancy agreement with the Province of Potenza on the "Assessment of the combined hydrogeological risk (landslides and floods) and the relative degree of exposure of the road network of the Province of Potenza". LaRis - "Landslide Risk Assessment Models" - School of Engineering, 2018-ongoing. MIUR-PRIN "Control of hydrogeological instability phenomena in urbanized areas and of particular historical-artistic importance through the integration of remote sensing and monitoring techniques". Other activities and studies were conducted for the Authority of Basilicata Basin in the field of landslides risk and vulnerability mapping, assessment and management. AQUADAM, MEDDMAN; ERANETMED-WATER 13-051-CrITERIA; Geological survey of the map "Muro Lucano" (Geological Map of Italy); Scientifictechnical consultancy for the definition of the Hydrology, Hydrogeology and Water Potential of the Monte La Spina carbonate aquifer and the San Giovanni di Castelluccio Inferiore spring front in Basilicata; - PON -SMART Basilicata. Collaboration activities with public administrations to test the satellite systems. Agreement with Regione Lombardia for "Sperimentazione del rilievo satellitare ai fini della previsione e delle procedure di lotta agli incendi boschivi". Operational Agreement between Presidenza del Consiglio, Dipartimento Nazionale di Protezione Civile e CNR-IMAA named "Sviluppo di tecniche satellitari per l'early Warning ed il monitoraggio near real-time di eventi estremi (eruzioni vulcaniche ed incendi boschivi)"; SPOT; OT4CLIMA; CH4TIR, Project "Validation of IASI Methane Products (VIMP); "Combined MWS and IASI-NG Soundings for Cloud Properties; Project "Utilisation of Reconstructed Radiances From IASI For Atmospheric Chemistry and Air Quality Applications".

<u>Spoke n° 2 "Technologies to reduce energy consumption and save biodiversity"</u>: UNIBAS participates through 5 different Departments (SI, DIS, SAFE, DICEM, DIMIE) by involving 39 researchers with expertise in several relevant fields including: production systems, inorganic chemistry, urban and territorial systems, analytical chemistry, chemical plants, nuclear reactor physics, entomology and pathology, natural ocean engineering. UNIBAS will capitalize on several European and National projects/agreements that have been implemented by the staff in the past years about the topics of the spoke including: PON 15-20 BIOFEEDSTOCK; PON 15-20 AIM - Activity 3 - Area of Specialization: Energy; Collaboration agreement between ENEA and UNIBAS in the frame of the PAR-2017 project; SMART BASILICATA; PrioritEE PLUS, Interreg MED Programme; European projects EU-FP7 and H2020 such as the FESTA project (http://www.festa-project.eu/) and the context of PhDs with companies through MIUR funding (recently on the topic of ENERGY with FIAT – FCA).


Ministero dell'Università e della Ricerca

Spoke n° 3 "Smart technologies for sustainable agri-food chain and forestry": Unibas participates in Spoke 3 by deploying agronomic, eco-physiological, entomological, veterinary and hydraulic skills. In particular, Unibas participates in Spoke 3 with the scientific responsibility of one OR (OR3 - Smart Water) and 9 Actions within other 3 ORs (OR 1, OR 4, OR 5), with the participation of 24 researchers from SAFE, DICEM, DIS, DIMIE. Relevant projects include: LIFE AGROCLIMAWATER; FARMS4CLIMATE; PON - ReSO "Resilience and sustainability of fruit and vegetable and cereal supply chains to enhance the territories"; "PRIN2017 "Emerging contaminants and reuse of treated wastewater in agriculture: fate in soil and plant system, ecophysiological response, soil microbiota and antibiotic resistance"; MIUR SIR 2014 "TritOmics: Domestication and Evolution of Triticum turgidum spp: an integrated 'omics approach"; PSR Basilicata 2014-2020, 16.2 "FeedInsects", CORES Basilicata 2014-2020 "Valorizzazione di biomasse vegetali per un'economia circolare a scarto zero" "Valbioeconomia", "G.O. CEREALIA" Lucan CEREALS" PSR Basilicata 2014-2020. Sottomis. 16.1; "Ottimizzazione degli input per la sostenibilità della cerealicoltura lucana - CERESO" FEASR PSR Basilicata 2014-2020. Misura 16 - Cooperazione Sottomisura 16.2 2019-2021; GO AcquaBasilicata -TRAS.IRRI.MA. "Transfer of technologies and mature irrigation management protocols for irrigation optimization" - 16.1 Rural Development Programs Basilicata 2014-2020; Nutri.Fe "Sustainability of fruit agroecosystems: soil fertility and nutrition" - 16.2 Rural Development Programs Basilicata 2014-2020. Spoke n° 6 "Digital transformation and technology transfer": Unibas will be involved as a participant for OR 6.1 and OR 6.2 and will be responsible for OR 6.3. Unibas will contribute to the activities of Spoke 6 with a group of 22 researchers with expertise in the field of computer science and engineering. Moreover, it will be involved in the validation and testing activities in the field of mathematics. In particular, Unibas intends to exploit the knowledge and expertise of the research groups with the Department of Mathematics, Computer Science, and Economics (DiMIE) and the School of Engineering (SI) in the field of Natural Language Processing, Language Models, Fact-Checking, Explainable AI, Deep Learning, and Mathematical Modelling.

Relevant very recent projects in the field of Spoke n°6 include MISE project CTEMT - HOUSE OF EMERGING TECHNOLOGIES OF MATERA; PON - ICOSAF (Integrated COllaborative systems for SmArt Factory); PON - PROMPT (Platform for Resource Planning and Product Development); from 2018-2021 the data-management group at DiMIE participated in the European project OIS-AIR (Establishment of the Open Innovation System of the Adriatic-Ionian Region).

National and international research collaborations

Unibas has obtained funding for numerous research projects in response to competitive calls in the 2014-2020 programming (PSR Basilicata, POR Basilicata, PON Research and Innovation, AIM, PRIN, EU framework programs) in cooperation with several regional, national and international public and private partners with an in-deep committing to technology transfer towards the companies that assumed a role of partner in these projects

B2.16) UNICAL

Previous experiences and scientific/entrepreneurial skills

Partner description. University of Calabria (UNICAL) is a public institution whose institutional mandate is to pursue research, teaching and third mission activities, contributing to the social, cultural and economic development of society. The organizational structure of the University, which recalls the provisions of Law 240/2014, is divided into a service structure, the General Management, and academic structures represented by 14 Departments, Specialization Schools, Research and Research Centers service and several Poles. Departments are responsible for carrying out scientific research, teaching and training activities.

Technology transfer activities. Since 2003, UNICAL, equipped with an office in charge of Technology Transfer activities, has implemented numerous actions to strengthen credibility and relationships within the regional and national innovation network and link research activities with industrial applications and spin-off creation. UNICAL research structure includes several research teams in many scientific areas that produced a very large array of research results: the most recent data count 166 research groups, 127 laboratories, 1,500 research lines, 39 active patent families, 43 spin-offs (150 employees with high training profiles) and 1 incubator of an enterprise (Technest, with an area of 2,000 m2). Spin-off companies, which were created from the enhancement of research products, on average have 6 innovative products (or services) and generate an annual production value of more than \notin 7,014K. UNICAL has in recent years developed a dense network of relationships with all the players in the development of the territory.



Secondary education: Among other initiatives, it is worth mentioning UniCalab, the annual Business plan competition, PhD 3.0 aimed at PhD students.

Involved departments and expertise. The researchers involved in the program belong to all departments. The involved expertise includes ICT, agri-food, sustainable and renewable energy, risk assessment and management, ICT, life science, manufacturing, green energy, confirming the interdisciplinary and complementary skills. Involved participants can claim outstanding scientific track records, with highly-cited publications appearing in high-impact journals and prestigious international venues. The University is the referent of two large Infrastructural projects of national and international importance such as the MATERIA-STAR infrastructure project which opens new investigations in all fields of Materials Science and a project linked to an integrated system of laboratories and research infrastructures for the provision of scientific and technological services dedicated to the monitoring, control and protection of the environment, called SILA (Integrated System of Laboratories for the Environment). Among the laboratories, the participation of: The Scalable Computing and Cloud Laboratory of DIMES is highlighted, which researches high-performance computing systems, cloud computing systems, Big Data analysis systems and applications, scalable and distributed systems, and The Modeling & Simulation Center - Laboratory of Enterprise Solutions (MSC-LES) of DIMEG which aims at the acquisition and deepening of knowledge and skills in the field of Modeling and Simulation. It is worth mentioning that in the ICT sector, UNICAL holds 6 patents, and other patents are held in the other fields involved in the National Centre like astrophysics, computational chemistry, and multiscale systems

<u>International scientific recognitions.</u> Participants to the proposal are active in the research community as editors or guest editors for international journals.

Project activities: UNICAL has shown an impressive capability to attract regional (n. **21** POR), Italian (n. **20** PON, PRIN) and European funds (n. **9**, FP7, H2020). In the last three years, the University has been the coordinator /leader of 20 EU research projects for a total amount of about 14 million euros.

<u>UNICAL role in Digital transformation</u>: Research groups involved in spoke 6 are also working in the general area of Data Analytics and parallel and distributed Data Mining, with applications in the areas of Urban Computing, Energy-efficiency in Cloud environments, Knowledge Discovery services on Cloud and Grid Computing systems, the analysis and monitoring of sensitive data using big data analytics techniques of Mathematics, Scientific Computing, Parallel Computing. See also detail below.

UNICAL role within the project: UNICAL will coordinate two Spokes:

Spoke n° 2 "Technologies to reduce energy consumption and save biodiversity". UNICAL participates through 8 different Departments (DIMEG, DIBEST, DINCI, DIMES, DIAM, DISCAG, CTC, FISICA) by involving 60 researchers with expertise in the fields of the spoke including: electric power systems, technologies and processing systems, transport phenomena and biotechnologies, hydraulic and hydrology, fluid dynamics, technical physics, electronics, geochemistry and vulcanology, hydraulic and maritime constructions and hydrology, telecommunications, etc. UNICAL will capitalize on several European and National projects that have been implemented by the staff in the past years about the topics of the spoke including: ComESto - Community Energy Storage: Aggregated Management of Energy Storage Systems in Power Cloud: National research project - PON MIUR PNR 2015-2020, 03/2018-09/2020; EBALANCE+ (H2020-LC-SC3-2019-ES-SCC864283); EU H2020 SEA4VALUE; EU-H2020 "The Blue Growth Farm" 774426 projects; H2020-NAUTILOS, PON SIGIEC; COMAS "Planned in Situ Preservation of Underwater Archaeological Artifacts" PONR&I Program; "SIRIO" - MIUR (PON01_01503), 2011 – 2015.

<u>Spoke n° 6 "Digital transformation and technology transfer".</u>UNICAL participates through the Departments DIMES, DeMaCS, DIMEG, DINCI, DISCAG and DESF. The research group formed by 86 researchers has a strong background in digital innovation and technology transfer, as it is witnessed by several national and international projects on these topics, including several PON projects with strong connections with SMEs (e.g., MAP4ID, SecureOpenNet, TrueDetective4.0, Catch 4.0, ID SERVICE, and S2BDW). Concerning the research activities, UNICAL has a consolidated experience in Artificial Intelligence, IoT, Cybersecurity. As far as technology transfer activities are concerned, since 2003 the University has had a Liaison Office, which manages the Technest incubator (with 30 incubated start-ups), which has contributed to attracting about 100 million euros in funding just in the 2014-2020 programme for research and development activities.

UNICAL will also participate as an affiliate partner in the following Spokes:



Spoke n°1 "Technologies to mitigate natural risk": UNICAL participates through 7 different Departments (DEMACS, DIAM, DIBEST, DINCI, DIMES, DISCAG, FISICA) by involving 49 researchers covering several relevant fields including: hydraulic and hydrology, fluid dynamics, hydraulic and maritime constructions and hydrology, technical physics, electronics, geochemistry and volcanology, electric power systems, technologies and processing systems, geotechnics. UNICAL will capitalize on several European and National projects that have been implemented by the staff in the past years about the topics of the spoke including: • H2020- NAUTILOS, Project "An integrated system for hydrogeological risk monitoring, early warning and mitigation along the main lifelines" (Lewis), financed by PON 2007-13 "Research and Competitiveness", co-funded by the European Regional Development Fund and MIUR; • Project RES-NOVAE - "Buildings, roads, networks, new virtuous targets for the Environment and Energy", project funded by the Italian Government (PON 04a2 E); • SMoRI – Smart Monitoring per il controllo di bacini ad elevato Rischio Idrogeologico", financially supported by POR Fesr-Fse Calabria 2014-2020 Asse I Azione 1.2.2; • National project PON01 02543 "Integrated and sustainable management service for the water-energy cycle in urban drainage systems"; • Interreg III B Archimed - PRODIM project (Proactive management of water systems to face drought and water scarcity in islands and coastal areas of the Mediterranean); • R&D Project "TEMAR - Tecniche e dispositivi per l'analisi e la valutazione del rischio di inquinamento delle acque di balneazione "- POR CALABRIA 2014-2020 FESR-FSE; • PON Research and Competitivness 2007-2013 "SIGIEC"; • POR Calabria 2014-2020 "VeroCost"; • Project (MATTM-)MTE "PreFluSed"; • International Project SNF (National Swiss Fund) 2016-2019 "BERYLLIUM"; • Management of an operational hydrometeorological forecasting system in agreement with the Calabria Region-UOA "Mountain and Forestry Policies" for the drafting of the Forest Fire Plan, years 2019 and 2020.

<u>-Spoke n° 3 "Smart technologies for sustainable agri-food chain and forestry":</u> UNICAL participates with 24 researchers and will capitalize on some of its patents on agri-food and agri-tech in addition to several international, national and local projects.

<u>-Spoke n° 4 "Technologies for the protection and enhancement of natural, cultural heritage and local identity</u> <u>also about climatic impacts"</u>: UNICAL participates through 9 Departments (DIMEG, DIBEST, DINCI, DIMES, DISU, DICES, DIAM, DCTC, Fisica) by involving 57 researchers covering several relevant fields including: Archaeometry, eXtended Reality and digital technologies, Archaeology, History, Robotics, AI, Sensors, etc. UNICAL will capitalize on 5 related patents and several EU and National projects including: H2020-iMARECulture, H2020-SEA4VALUE, H2020-TECTONIC, H2020-INSECTT, InterregMed-BlueMed, EASME/EMFF DiveSafe, PAC-VISAS, PON-MATACOS, PON-COMAS, POR-HeritageBot, POR-NanoProtect; etc. UNICAL will use labs of the STAR Research Infrastructure and in particular the Laboratory of Rapid Prototyping and the Laboratory of Modeling, Simulation and Visualization.

Spoke n° 5 "Technologies for a healthy nutrition and resilient communities" UNICAL participates with 24 researchers and will capitalize on patents on life science (nutraceuticals,

nanotechnology, molecules, peptides) in addition to several international, national and local projects.

National and international research collaborations

UNICAL actively participates in national and international initiatives aimed to foster innovation in different areas (see details above). The number of international cooperation agreements is 251 with institutions from 54 countries. For some years UniCal has been included among the approximately 30 Italian universities selected to participate in the largest world fair for Higher Education, NAFSA, which is held in the USA. Recently, a university centre in Cuba and Santo Domingo - UniCaribe - and a forum for research of 22 Italian and Ecuadorian universities in Ecuador - FUCSIE have been set up. Furthermore, two important programs for the mobility of outgoing and incoming teachers/researchers funded by the Calabria Region will be launched shortly. Since its foundation, the University of Calabria has shown a strong international vocation by hosting, at the end of the 1970s, the first community of Chinese students in Italy. A living and open reality where it is possible to taste the flavours and colours of the world, characterized by socialization and integration activities that make the Campus a place where cohesive social peoples and peaceful coexistence are achieved.

B2.17) UNICZ

Previous experiences and scientific/entrepreneurial skills

Partner description: The University Magna Graecia (UMG) of Catanzaro (hereafter UMG or UNICZ) is composed of 4 Departments, 14 Research Centers and 3 Centers of Service. UMG hosts 3 Doctorates and 29 Schools of Specialization in the bio-medical area. Inside the Campus is located the University Hospital "Mater



Domini", close to the research laboratories, according to the "from-bench-to-bed principle". Overall, UMG personnel includes 306 professors, 150 doctoral students, 150 research fellows and 160 units of technical-administrative staff.

Technology Transfer activities: Over the past 10 years, UMG has accompanied numerous researchers in technology transfer activities. These activities are exploited through two different subjects: a) the consortium company Biotecnomed, manager of the Calabrian innovation district for life sciences and biotechnologies, and, b) the Rubino and Associates patent studio, with which it has entered into an agreement that assists UMG researchers from the initial phase of the project, to the submission of the patent application and the subsequent steps up to the market. Four academic spin-offs operate in strong synergy with UMG researchers: a) Net4Science, aimed at developing an innovative chemoinformatic platform devoted to drug discovery using repositories of synthetic or natural compounds; b) Alifun, focused on the design and development of functional food and nutraceutics capable to improve human health; c) Biopepticom, aimed at developing diagnostic kits capable of determining the "reproductive" health of the subjects under examination; d) Medifarmagen, focused on the design and development of diagnostic tests capable of reducing the improper prescription of drugs, increasing adherence to therapy and reducing the development of adverse reactions and drug interactions. Several patents related to the topics of this ecosystem are present in the UMG patent's portfolio, going from nutraceutics, cosmeceuticals, to wearable devices and innovative drug-delivery devices.

Departments and expertise: Researchers with different educational backgrounds work in the laboratories of the three biomedical departments. The added value of the University of Catanzaro is represented, in fact, by the interdisciplinary nature of the sectors, ensured by the presence and, therefore, by the strong collaborations, between medical doctors, biologists, biotechnologists, physicists, chemists, mathematicians, nanotechnologists, pharmacists, bioengineers, computer scientists.

International scientific recognitions: Over the years, the expertise of these researchers has produced a significant number of publications appearing in peer-reviewed journals, patents and has attracted an important amount of Italian and international funding on a competitive basis.

<u>Secondary education</u>: Several higher education courses (advanced courses, first and second level masters) are active at the Magna Graecia University of Catanzaro for graduates in biomedical and pharmacological disciplines, focused on the issues of nutraceuticals, cosmeceuticals and environmental sustainability. There are also 4 research doctorate courses with a strong industrial footprint, which provide, at the end of the doctoral course, the possibility for the PhD to create an academic spin-off, transferring the results of his research to the market.

<u>**Project activities:**</u> International and national projects/collaborations proposed or already existing have been included in the different spokes in which the university is involved.

<u>UNICZ</u> role in Digital transformation: As far as digital transformation is concerned, the researchers of the degree courses in computer and biomedical engineering have been involved in numerous initiatives; among these, a project financed by the Ministry of University and Research which provides for the digitization of some areas of the city of Catanzaro using 5G technology to provide help to fragile subjects, with walking difficulties or modest cognitive decline.

UNICZ role within the project: UNICZ will coordinate the Spoke n° 5 "Technologies for a healthy nutrition and resilient communities". UNICZ will participate through its 3 biomedical departments (Department of Experimental and Clinical Medicine, Department of Medical and Surgical Sciences and Department of Health Sciences) and will involve 67 units of researchers (full professors, associate professors, researchers, technologists) with skills strongly interdisciplinary, ranging from clinical, biology, pharmaceuticals, nutraceutical, bioengineering, chemistry, nanotechnologies. The National Research Infrastructure Biomedpark @ UMG, located at the Campus of the University of Catanzaro, will contribute to the activities developed by UNICZ through 5 technological platforms: 1) Functional genomics; 2) Proteomics and stem cell biology; 3) Neuroscience; 4) Pharmacology; 5) Imaging of the Body Districts. UNICZ researchers will benefit from the experience gained over the years through numerous national and international projects on a competitive basis; among others: a) Sixth Framework Program, European Commission: Development of an Integrated Platform for Nanoparticle analysis to verify their possible toxicity and the eco-toxicity (DIPNA); b) Seventh Framework Program, European Commission: Single or few molecules detection by combined enhanced spectroscopies (SMD); c) PON Research and Competitiveness - Smart Cities and Communities and Social Innovation; d) PONa3_00435 - MIUR: Project for the implementation and enhancement of an integrated biotechnological platform for the development and promotion of research and innovative services in the field of human chronic



Ministero dell'Università e della Ricerca

and neurodegenerative diseases - Biomedpark @ UMG. The group proponent has been also involved in numerous scientific projects aimed at the development of functional foods and nutraceuticals: • ALIFUR Development of new Functional FOODS for Rehabilitation, funded by the Calabria Region (POR CALABRIA FESR -FSE 2014-2020). • ALIFUD Development of new functional foods effective for the health of postmenopausal women with osteoporosis" funded by the Calabria Region POR CALABRIA FESR 2007/2013 (CCI N ° 2007 IT 161 PO 008). • Monocentric study "LIVOGEN IN LIVER STEATOSIS" funded by Tishcon Corporation, Westbury, NY & Salisbury, MD (USA). • Monocentric study "Comparative Study of a Calabria's tomato sauce rich in carotenoids and Danacol on the reduction of LDL Cholesterol in subjects with Polygenic Hypercholesterolemia" funded by the SISA Foundation-Italian Society for the Study of Atherosclerosis, and DANONE spa. • Monocentric study on "Proxian" funded by the ErreKappa company. • "Evaluation of bergamot polyphenolic fraction effects on lipid accumulation in human hepatocytes" funded by MIUR (codice del progetto: PON 03PE 00078 1). • Monocentric study on "Role of the Mediterranean Diet and Vitamin D in preventing Cognitive Decline in subjects with cognitive impairments" funded by the Ministry of Health (project code: GR-2009-1567179). • Multicenter study "Effects of the consumption of a diary fermented product enriched with phytosterols on hypercholesterolemia management in hypercholesterolemic adults" funded by DANONE spa. • Monocentric study "PAFUCOL - Development of a new effective functional PAsta for the treatment of polygenic hypercholesterolemia" funded by the Calabria Region INGEGNO POR CALABRIA FESR-FSE 2014-2020. • Monocentric study "SALNAF- Functional tomato sauce for the treatment of Non alcoholic Fatty Liver Disease" funded by the Calabria Region INGEGNO POR CALABRIA FESR-FSE 2014-2020. In addition, there are 10 relevant publications; 65 degree theses: 4 doctoral theses, 11patents, 10 collaborative and commissioned projects related to the spoke's program.

UNICZ will also participate as an affiliate partner in the following Spokes:

Spoke n° 6 "Digital transformation and technology transfer": UNICZ involves the Bioinformatics and Bioengineering research group that comprises 8 researchers within 3 Departments (DSMC, DSS, DIGES). Moreover, UNICZ will also involve its Data Analytics research centre that works on the artificial intelligence applied to bioinformatics and health informatics. will capitalize on several National and Regional projects including • PON MISE - Fund for Sustainable Growth - Call "HORIZON 2020" PON I&C 2014-2020, Ministerial Decree of 1 June 2016. Prog. n. F / 050201 / 01-03 / X32 Project MATE Multifunctional assistant for young and old children - A bracelet for life; • WEEPIE - WEarable Programmable device for compliance Enhancement, wearable and programmable device for improving compliance in drug-taking", POR CALABRIA 2014-2020; • MOLIM ONCOBRAIN LAB - Innovative methods of molecular imaging for the study of oncological and neurodegenerative diseases PON MIUR 2014 - 2020 Project Code ARS01 00144; • NADITEMM - NEW DIAGNOSTIC AND THERAPEUTIC APPROACHES FOR DYSMETABOLIC DISEASES - PON MIUR "Research and Innovation" 2014 - 2020 Project Code ARS01 00566; • PON01_01180, NEUROSTAR - NEUROSciences and Systems, Technologies and Advanced procedures for early diagnosis/prognosis and Recovery/containment of functional damage in subjects with severe disabilities from acquired pathologies of the central nervous system. PON MIUR 2007-2013; • NEUROMEASURES "Development of innovative processes and support services for the early diagnosis of motor, behavioural and memory disorders in Parkinson's disease and Alzheimer's dementia" PON MIUR 2007-2013

National and international research collaborations

UNICZ actively collaborates with international bodies aimed to foster innovation in different areas: among others, Department of Molecular and Clinical Medicine, Sahlgrenska Center for Cardiovascular and Metabolic Research, University of Gothenburg, Göteborg, Sweden: Joy Wolfram, Mayo Clinic, Florida (USA); Helder Santos, University of Groningen; Samir EL Andaloussi, Karolinska Institutet; Cédric Blanpain, Université Libre de Bruxelles; the University of Paris-Saclay in Châtenay-Malabry, France; International collaborations are ongoing with the Technische Universitat Munich (Germany), Universidad de Coimbra (Portugal), National Institutes of Health, Bethesda (USA). Ongoing projects include • PON VQA and POR Living Lab Misurare Gesti. Recently completed projects include: • PON BA2Know (Business Analytics to Know) that implemented services based on Business Analytics and Knowledge Management addressed to SME and Public Administration, in the Energy, Health and Transport fields; • PON INMOTO that implemented innovative services for the creation, certification, monitoring and promotion of the Tourist and Cultural Offerings and to support Tourist Mobility, including services related to the health of tourist; • PON STAYWELL that provided solutions for Smart Cities and communities and social innovations, including high-value services in the area of health, welfare and well being. • The Bioinformatics and Bioengineering research group has been working



Ministero dell'Università e della Ricerca

since 2002 at the School of Medicine and Surgery on the following topics: modelling and analysis of omics and clinical data, analysis of texts in medicine, analysis of biological networks and pathways, sentiment analysis, geographic systems and geo-epidemiology, analysis of bioimaging and biosignals, biomedical devices, bioengineering models for artificial organs, artificial intelligence in biomedicine and bioinformatics.

B2.18) UNIRC

Previous experiences and scientific/entrepreneurial skills

Partner description: Unirc is organized into 6 Departments which include more than 80 research and teaching laboratories covering around 7500 square meters. The academic staff encompasses more than 250 professors (44 full profs., 103 associate profs., 118 assistant profs.) and more than 100 Post-docs/PhD students, with the latter ones enrolled in 5 different PhD courses (in Information Engineering, Civil Engineering, Agricultural, Food and Forestry Sciences, Architecture, Law and Economics). The PhD Course in Information Engineering is a partner of the H2020 MSCA-ITN A-WEAR (a European Joint Doctorate) since cycle XXXV (2019-2022). The mission of UNIRC is to promote the growth of the Calabria Region and Italy through top-quality higher education activities, research (> 4500 papers published in the last 10 years) & innovation activities in critical societal assets related to climate change and sustainable development, including risk assessment and protection, agritech, cultural heritage, smart cities, green energy, ICT. UNIRC is leading research to help mitigate and adapt to the risks and impacts associated with climate change. Active research lines include, among many, adaptation and resilience to climate impacts; protection, preservation and restoration of the biodiversity through natural habitats and ecosystems; energy solutions; green and sustainable chemistry; clean transport; climate change adaptation for infrastructure; hydro-geological resilience; management of soil and water resources; sustainable agriculture.

Departments and expertise. The researchers involved in the program belong to all departments and in particular those from the Engineering, Architecture, and Agricultural areas. The involved expertise includes ICT, agri-food, sustainable and renewable energy, risk assessment and management, green energy, confirming the interdisciplinary and complementary skills of the UNIRC group. Involved participants can claim outstanding scientific track records, with highly-cited publications appearing in high-impact journals and prestigious international venues. Roughly 20 laboratories will be involved in the project, with cutting-edge equipment.

International scientific recognitions. Participants to the proposal are active in the research community as editors or guest editors for international journals. A relevant number of participants (roughly 15) have been also mentioned in the **Top 2% Scientists in 2019 and 2020** (Stanford University ranking). UNIRC is among the top universities according to the StuDocu World University Ranking 2021.

<u>Technology Transfer activities.</u> The research system is aimed at promoting employment and business development through the first level of technology transfer, currently represented by 15 Spin-offs and Start-ups in various KET (Key Enabling Technologies) sectors. UNIRC has established relationships with several consortia like ICT-SUD, ICT NEXT S.C.A.R.L and is also a partner of several innovation centres ("Poli di Innovazione") in Calabria related to the S3. UNIRC also stimulates knowledge exploitation (with roughly 20 patents filed in the last 10 years). Activities carried out within the project will allow to consolidate the existing collaborations and favour the participation to other competitive EU/national calls. Notably, UNIRC has recently signed a Memorandum of Understanding for the creation of a high-tech innovation hub ("AGAPI", Area Grecanica Advanced Platform for Innovation) involving several partners (e.g., TIM, Huawei, Engineering, NTT Data, FS). An 'Agritech Academy' (spoke 3) for continuing education and transfer is also foreseen.

Project activities. As compared to its dimensions, UNIRC has shown an impressive capability to attract regional (n. 14 POR), Italian (n. 4 PRIN, n. 34 PON) and European funds (n. 11, FP7, H2020) in the last few years as well as to handle complex projects (at least two of them exceeding 6.5 M€). Over the past 10 years, UNIRC participated in national and European research and development programs and projects for an amount of over 100 million euros.

<u>UNIRC</u> role in Digital transformation. Unirc through DIIES promotes a "factory" of digital solutions to support and enable the proposed innovation ecosystem in line with the smart specialization strategy (S3). By leveraging the new frontiers in ICT technologies, future networking paradigms, AI algorithms, cybersecurity solutions and IoT systems, UNIRC aims at developing disruptive technologies that promote the digital transition of the territories, while also contributing to the reduction of development gaps.

UNIRC role within the project: UNIRC will coordinate the Spoke n° 3 "Smart Technologies for sustainable food supply chain and forestry" by involving 79 experts. In this context, UNIRC possesses long-term experience in: (i) the sustainable development of agriculture, (ii) the agri-food supply chains in the Mediterranean area; (iii)



the development of innovative models of sustainable agriculture to cope with the impact of climate change; (iv) food safety and nutritional functionality of food sources; (v) the sustainable agricultural production, plant genotypes, microbiome, pesticides, postharvest diseases; (vi) the soil quality and conservative agriculture, erosion and soil losses modelling, carbon storage and soil GHG emission; (vii) the adaptation to biotic and abiotic stress and metabolomics analyses; (viii) microbiome and plant growth, evolution and protection; (ix) materials and nanotechnological applications for authentication and protection of agro-food products. Relevant projects in the field of spoke n°3 with UNIRC as Coordinator include: MUR SAF@MED, PON AGRIFOODTECH, PON FINGERIMBALL, E-BREWERY. UNIRC will also participate as an affiliate partner in the following Spokes:

Spoke n°1 "Technologies to mitigate natural risk": UNIRC participates through 4 different Departments (DICEAM, dArTe, DA, DIGIES) by involving 24 researchers covering several relevant fields including: geotechnical engineering, hydraulic and maritime constructions and hydrology, hydraulic, geomatics, agricultural hydraulics and land conservation, forestry and silviculture, rural buildings and agro-forest landscape planning, urban planning, roads, railways and airports, experimental physics, mathematics, etc. UNIRC will capitalize on several European and National projects that have been implemented by the staff in the past years about the topics of the spoke including: • PON ARS01 00158 TEMI MIRATI "Technologies and Innovative Models for landslide risk mitigation for critical infrastructures", 2019-2022. Research project PON01_1869 TEMADITUTELA "New Technologies and Materials for Land and Environmental Protection", 2011-2015. EU H2020 project "The Blue Growth Farm": implementation at sea in relevant environment of a complete monitoring system of floating structures for acquisition of wind and wave data; • PON R&C project 2007-2013: "Building Future Lab", section "TEST WATER": test in the relevant environment of the NOEL lab of test of a floating platform, a small scale field model of an artificial floating city; • Eu Marie Curie project "Large multipurpose platforms for exploiting renewable energy in open seas" (PLENOSE) FP7-PEOPLE-2013-IRSES: validation of numerical and analytical models for previsions of extreme events at sea, for the reliability of coastal structures; • MATTM project "Impianto U-OWC e Turbina ad Aria per la produzione di energia elettrica da onde di mare - POSEIDONE: small-scale field experiment at NOEL lab on a wave energy converter for the conversion of wave energy; • PRIN project "Landslide Risk Mitigation by Sustainable Measures" (PRIN Tender 2010-2011).

Spoke n° 2 "Technologies to reduce energy consumption and save biodiversity": UNIRC participates through 2 Departments (DICEAM, DIIES) by involving 18 researchers with expertise covering several relevant fields: machine/deep learning, electronics, physics and optical spectroscopy and environmental technical physics. In the research field of the Spoke n°2, UNIRC's researcher's activities have been focused on the: (i) advanced materials energy production; (ii) valorization of CO₂ into sustainable fuels and chemicals; (iii) marine energy generation; (iv) AI for smart grid applications, (v) green hydrogen production; (vi) H₂ as energy vector. Unirc will capitalize on several European and National projects that have been implemented by the staff in the past years about the topics of the spoke including: EU TEN-T REWEC3-2013-IT-92050-S, PON AEROMAT, PRIN2017 DIRECTBIOPOWER; MATTM project "Impianto U-OWC e Turbina ad Aria per la produzione di energia elettrica da onde di mare - POSEIDONE "small-scale field experiment at NOEL lab on a wave energy converter for the conversion of wave energy"; PAR 2015/2017 - CNR-MiS-DICEAM "Sistemi elettrochimici per la generazione e l'accumulo di energia, WP: Catalizzatori per processi di metanazione". Within Spoke n°2, it will take advantage of consolidated collaborations with more than 10 different Universities and Research Institutes, 5 European academic institutions as well as several American (North and South), Asian and Australian Universities.

<u>Spoke n° 4 "Technologies for a resilient and accessible cultural and natural heritage"</u>: UNIRC participates through 3 Departments (dArTe, PAU, DICEAM) by involving 36 researchers with expertise in structural analysis, modelling and prototyping, testing, geotechnical investigation, advanced regenerative design with adaptive and enabling technologies, territorial and urban planning and design, adaptive design and technological innovations for the resilient regeneration of urban districts to face climate. UNIRC will capitalize on several European and National projects that have been implemented by the staff in the past years about the topics of the spoke including: PON 14-20 GENeSis, Interreg URGES, UE MiTE RCMetrocitizensintransition; H2020-NMBP-TO-IND-2018-2020, H2020-TREND; H2020 MAPS-LED, PRIN 2017 SOUND, FESR POR CALABRIA 14-20 Progetto "Visualizing Innovative and Social Artworks (VISA)". UNIRC will use Infrastructure Research (IR) (BFL - BUILDING FUTURE LAB) as well as other 20 <u>University LABs</u>.





Advantage will be taken of consolidated collaborations with more than 20 different Universities and Research Institutes, several international academic institutions.

<u>Spoke n° 6 "Digital transformation and technology transfer"</u>: 22 experts from UNIRC belonging to 3 different Departments (DIIES, DIGIES, DICEAM) with a consolidated experience in ICT, telecommunications, computer science, cybersecurity, electromagnetics, measurement instrumentation, robotics and automation, electronics, artificial intelligence and decision-making systems. Relevant very recent projects in the field of Spoke n° 6 include: iCare; COGITO; MyPaSS; PM3; DOMUS Sicurezza.

National and international research collaborations

UNIRC aims to take advantage of its well-established collaborations with national and international research entities with well-recognized expertise in the field of the proposed project. As witnessed by joint publications, projects, tutorials and panels organization, UNIRC has consolidated collaborations with roughly 20 different Universities in Italy, as well as with different CNR Institutes, STMicroelectronics, TIM, Thales Alenia Space Italia, Selex/Leonardo S.p.A, ENEA Trisaia. Collaboration with International partners involves joint research programs and publications with many different Universities and research centres, including roughly twenty European academic institutions as well as several American (including MIT and Georgia Tech) and Australian Universities. Non-academic cooperations include ESA, European Defense Agency, EURECOM, NEC Heidelberg, Ericsson Research Finland, Huawei, ETH Zurich, INRIA France, Space Engineering S.p.A./Airbus, MBDA Missile Systems, and many others.



C) CHARACTERISTICS, FEASIBILITY AND CONTROL

C.1) Critical mass involved

The Tech4You research program meets the size requirements (according to art. 7 of the call), providing a "critical mass" of 1004 researchers belonging to different public partners and participating in the development of thematic activities grouped into 6 spoke.

C1.1 Spoke and affiliates

The following table shows the spokes structure of the ecosystem, with the affiliates associated with them. All these partners have been selected considering specific competencies and experiences in the scientific and technology areas of the research and innovation program and coherent with its aims.

	Research theme	Spoke	Affiliates	Mot	ivation
1.	Mitigation of geo-hydrological and forest fire risks	CNR	Unical, Unibas, Unirc	See B.2	section
2.	<i>Reduction energy consumption and save biodiversity</i>	UNICAL	Unibas, Unirc, CNR, ARPACAL, Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), EIT Manufacturing SRL, RINA Consulting – CSM SpA, Techfem SpA	See B.2	section
3.	Sustainable agri-food chain and forestry	UNIRC	Unical, Unibas, CNR, CREA, TIM	See B.2	section
4.	Resilience and accessibility of cultural and natural heritage	UNIBAS	Unical, Unirc, CNR	See B.2	section
5.	Healthy nutrition and resilient communities	UNICZ	Unical, Biotecnomed Scarl, EPITECH Group SpA	See B.2	section
6.	Digital transformation and technology transfer	UNICAL	Unibas, Unicz, Unirc, ENM, Engineering, NTT Data Italia SpA, Entopan Innovation SRL	See B.2	section

C1.2 Human resources

The following table summarizes the overall human resources (n. 1.004), apart from those recruited during the implementation of the program, involved to carry out the activities of the research and innovation program, with the breakdown by single Spoke and affiliates.

		spoke 1	spoke 2	spoke 3	spoke 4	spoke 5	spoke 6	total	Nr curriculum	female
1	UNICAL	49	123	24	57	10	86	349	265	111
2	UNIBAS	24	39	17	77	0	12	169	148	56
3	UNIRC	24	18	79	36	0	22	179	133	40
4	UNICZ	0	0	0	0	67	8	75	75	36
5	CNR	36	50	9	7	0	0	102	102	43
6	ISPRA	0	7	0	0	0	0	7	7	3
7	ARPACAL	0	7	0	0	0	0	7	7	2
8	CREA	0	0	7	0	0	0	7	7	5
9	ENM	0	0	0	0	0	7	7	7	1
1	RINA	0	10	0	0	0	0	10	10	2
2	TECHFEM	0	9	0	0	0	0	9	9	4
3	EIT MANUFACTURIG	0	9	0	0	0	0	9	9	6
4	TIM	0	0	7	0	0	0	7	7	1
5	BIOTECNOMED	0	0	0	0	7	0	7	7	4
6	EPITECH	0	0	0	0	9	0	9	9	5
7	ENGINEERING	0	0	0	0	0	21	21	21	4
8	NTT	0	0	0	0	0	7	7	7	2
9	ENTOPAN	0	0	0	0	0	23	23	23	7
	Total	133	272	143	177	93	186	1004	853	332

Regarding the recruitment of new staff involved in the activities of the research and innovation program, all partners will use public procedures aimed at ensuring the involvement of the best skills in the national and

international context in terms of scientific quality and attitude to innovation. As detailed in section C.7, special attention will be paid to the inclusion of clauses in these procedures that encourage the recruitment of young researchers, including those from abroad. The following table summarizes the overall numbers of staff.

	Internal staff	P/M	New Research staff	Industrial PhD
spoke 1	133	890	33	25
spoke 2	272	1065	41	20
spoke 3	143	946	28	11
spoke 4	177	845	30	44
spoke 5	93	945	12	11
spoke 6	186	1700	19	2
total	1004	6259	163	113

C.2) Hub

Finanziato

dall'Unione europea

NextGenerationEU

Tech4You is a unique collaborative innovation ecosystem where the regional public R&D actors deploy their technology offerings into specific innovation verticals (Spokes) under the coordination of the Hub. Spokes will implement a subset of innovation activities while the Hub will ensure the Spokes' alignment to achieve the shared goals and sustain the accomplishment of collaborative behaviours. Leadership, control, and expectations setting management are key tasks of the Hub which influence the effectiveness of governance mechanisms in aligning partners' activities.

Governance

The Hub formulates the ecosystem's strategy, coordinates the institutional system, governs the technological architecture, ensures the alignment of the value proposition, and attracts stakeholders capable of contributing to the proposition. More specifically, Tech4You Hub will ensure the coordination of :

- governance: the design of the consortium governance structure, being Tech4You a separate non-profit entity plays a key alignment role;
- contracting: the methods by which the consortium monitors the activities of the members includes setting KPIs and defining the procedures to access the funding and applying laws and regulations that must be followed in the process, according to the specific requirements set forward by the Innovation Ecosystem Call for proposals regulations;
- technology infrastructure is needed to ensure that the financial spending and delivery data are duly collected and released, including the financial data and the reports. Technology and data system are a key part of the equation in developing the Tech4You model.

Tech4You considers that a focused collaboration between Universities, small and medium-sized enterprises and the industry relies on the alignment of different motivations to achieve shared goals. One of the mechanisms to foster good working relationships will be to establish transparent governance mechanisms that will underpin the collaboration and instil a high degree of accountability in all Tech4You partners.

An internal governance structure will be designed to oversee access to a centralized database for research and innovation purposes, using homogeneous formats and metrics among the Spokes and between the business and the academic partners (affiliates). The central database will be hosted by Unical whose requirements relating to data security and handling are very strict.

Data management process

The mechanisms for the appropriate and lawful use of data are a prime requirement to address the challenges of the Spokes: the appropriate data management processes will ensure the effective management of the Consortium, but will also facilitate the exchange and the use of data, thus meeting the goals of the Ecosystem. The Hub management team will deploy its activities through a technology platform to monitor the outputs, to manage the technological architecture to enhance the spokes performance, and match the spokes specific objectives and the ecosystem's goal. The Platform will (i) encourage the active participation of ecosystem actors in the value co-creation process, ensuring a clear vision and a shared value base on which the ecosystem activities can be built and (ii) support the ecosystem actors to make new connections and for a dynamic sharing of their knowledge and resources in concrete ways.

Spokes participants will be briefed on how data would be stored, shared, and aligned with the GDPR demands, though it will be allowed an open discussion in case there are different views across the Spokes about the process for data access and whether it is even necessary.



As part of the project Grant Agreement, all data producers will be required to make their results available to the consortium, though this may raise issues on who should have access to data and who should be recognized for data generation in case some data can generate intellectual property. In this case, the Hub IT Officer can provide a useful point of contact for queries relating to specific aspects of access for data, enabling many issues to be anticipated and discussed in advance.

Ecosystem Governance Dynamics

The ecosystem performs through selfgenerating and inclusive governance. The framework is based on a matrix in which the Spokes represent the vertical operating segments guided by the major Research Institutions in the area and also the shareholders of the Limited Liability Cooperative Company (SCARL - Società Cooperativa a Responsabilità Limitata), legal form of the Ecosystem Hub.

The governance bodies of SCARL will be the following:

- 1. Assembly of Shareholders which contemplates the representatives of the Universities, the two reference regions, and other shareholders;
- Hub Shareholders' Auditing Board Mission Hub Board of Directors Advisory Board Execution Hub Central Management Office Public Stakeholders R&I Milestones & Target R&I planning Funds & Supprt Industry Spoke 1 Spoke 3 Spoke...r Stakeholders
- 2. **Board of Auditors**: appointed by the Shareholders Meeting, consisting of **2 offective** members and 2 alternate m
 - 3 effective members and 2 alternate members enrolled in the register of Auditors;
- 3. Advisory board / scientific committee (AB): the Assembly of Shareholders will appoint it according to the rules laid down in the Statute, intending to create a consultative, control/monitoring, and propositional function concerning the Bodies' decisions. The composition of the AB provides for the representation of significant expressions of public and private stakeholders;
- 4. **The Board of Directors (CDA)** will include 6 members: 1 representative for each University plus 1 representative for each Region. Among its members, a President is elected by the Assembly of Shareholders and she/he will have the legal representative of SCARL. The Board of Directors is the strategic interface of the Hub management structure;
- 5. **Central Management Office (CMO)**: it represents the managerial and executive structure of the Hub, in support of the Spokes and is responsible for the engagement of the public and industry Stakeholders. In fact:
 - a. public (Government) and private (Industry) Stakeholders are involved with an Engagement & Dissemination strategy, aimed at building collaborative relationships with high added value and, consequently, a consensus around the Research and Innovation policies promoted by the Ecosystem;
 - b. the Spokes are the main interlocutors of the Hub CMO, with whom they establish a collaborative relationship that presents the following fundamental flows: i) the Spokes share with the CMO their Research target and milestones, as well as the KPIs of their Research and Innovation actions in the Ecosystem; ii) the CMO coordinates and monitors the Spoke R&I programs and controls their use of the funds.



Ministero dell'Università e della Ricerca

Hub Central Management Office

The Hub CMO provides a functional organizational model executing the priorities of coordination and efficiency in the actions of the ecosystem.

The **Program Manager (PM)** acts as the person responsible for implementing the strategic priorities agreed in the Ecosystem Development Plan approved by the Board of Directors and ratified by the Assembly. The PM is responsible for coordinating the organizational structure of the Hub.



The PM has 2 staff functions and 4 line functions coherently designed with the functional model shown.

The administrative advisory and the secretariat are the 2 staff functions. The first supports the PM and his/her team in handling complex administrative matters. The secretary organizes the CMO agenda.

The line functions identify the primary competencies necessary to ensure full implementation of the Innovation Ecosystem, promote the essential connections with the Spokes, and optimize the available resources.

The functions with the most significant operational impact are the Financial Officer (FO) and the Innovation Program Officer (IPO), which operate according to a precise criterion of distribution of responsibilities in managing the resources allocated to Spokes:

- the IPO takes the responsibility of guiding the programming of the open calls for the Spokes, supporting the instruction of the call projects consistent with their R&I Milestones and the Targets. The cascade funding program management also refers to the feedback (KPIs) received from analyzing the innovation programs currently issued by the Hub or other entities;
- the FO manages the funds and resources destined for the open calls and carries the due diligence, monitoring, control, and reporting activities on the recipient Spokes according to the law and the rules of the calls.

This separate management of the responsibilities in the programming and use of the funds destined to the Spokes guarantees balanced and rigorous management of the resources, as part of the unitary management of the Hub presided over by the Program Manager given the Ecosystem Development Plan approved by the main Stakeholders.

Two other functions complete the organisational structure: one is related to the **IT Officer** (**ITO**), who supervises the implementation and management of the HUB Operations information systems. In particular, the ITO will make use of two specialists: the first for the part of ERP - Management and accounting information system; the second supervises the management of the public and private contents of the HUB on the Collaborative Work platforms and in general on the digital communication interfaces of the HUB.

The other fundamental function is the **Communication & Public Engagement (PE) Officer** who has the task of coordinating the Communication and Public Engagement & Dissemination activities that will animate the ecosystem and involve public and private subjects in supporting the Research and Innovation strategy of the HUB. The responsibilities of this function include the roles of Communication Specialist and Press Office Management.

The strategic objectives of the communication, PE and dissemination actions are: *information*, *collaboration*, *sharing*. More specifically, the actions will be aimed at favouring:

- promotion, to communicate all the activities, results and impact of Tech4You to the general public;
- **recruiting**, to circulate the scientific results among all the subjects of the innovation ecosystem (HUB, Spoke, affiliated with the spokes) to encourage collaboration and dissemination of the values and effects of the Project;
- **engagement**, to share with all Tech4You targets (stakeholders, companies, policymakers, citizens, information operators, even at an international level) the opportunities generated by the project aimed at improving the standards of the quality of life of all and environment.

The communication and public engagement tools used, online and off-line, to reach the "Multiple audiences" target are: press office and media relations; web site; social media; newsletter; promotional materials; as well as the initiatives described in point C8 of the project form.



The dissemination tools used, online and off-line, to reach the target of specialists interested in the results of the Project are: scientific publication, workshops demonstration, participation in national and international sector initiatives; webinar; Dedicated Youtube channel to disseminate videos and interviews on the results and impact of the Project, IEEE Collabratec® as collaboration and professional networking platform.

Specifically, to encourage match-making between the offer of advanced technologies generated by Tech4You and the target groups that intend to use these technologies, two types of specific events will be organized:

- 1. **Tech4You Match Making**, a meeting event between the scientific, technological and business realities of the innovation ecosystem and the possible users of Tech4You technologies (academics, companies, productive and professional trade associations, third sector realities, etc.) to use digital technologies to improve the quality of life and the environment.
- 2. *Tech4You Spotlight Talks*, short and original presentations organized by the scientific, technological and business realities of the Innovation Ecosystem to illustrate the new Tech4You solutions and technologies to the identified target groups.

At the end of the project, an international event will be organized to present the results obtained and the solutions that the Innovation Ecosystem offers to the various targets, including civil society: the **Tech4You Event - International Innovation Festival**.

Ecosystem set-up phase & Competence Building

In its founding phase, the HUB is conceived and managed in a Project Management logic aimed at building the processes and skills necessary for the implementation of the Ecosystem Development Plan. The Program Manager performs the functions of Project Manager, using the reference Officers of each function and specialized and qualified partners to effectively build the **Mega Processes** that oversee each function and lay the foundations for a gradual organic expansion of the organizational structure.



The Project Management Task Force thus formed aims to support the management structure of the HUB in the start-up phase and to generate the knowledge and skills functional to the optimization of the Mega Processes represented in the figure.

The design of processes and related business skills is set with an *adaptive* logic concerning the gradual development of the fundamental role of support and coordination that the HUB will play for Spoke and the entire Ecosystem. Three fundamental phases are considered in the construction of each *sub-Major* process, to start a self-generating cycle of *Learning & Knowledge Management*:

- 1. *Engineering* implementation and execution of activities based on available knowledge;
- 2. *Monitoring* measurement of the impacts and effectiveness of the activities implemented;





3. *Planning* - an evolutionary adaptation of implemented and planned activities based on learning. Using this approach, we arrive at an initial structure of Mega & Major Processes about each of the envisaged functions, destined to evolve with continuous upgrading cycles.

Innovation Program Officer	Financial Officer
 Innovation Program Analysis & Evaluation 	Tender Execution & Monitoring
 R&I Master Plan Assessment 	• Tender Panning - Accountable IPO
 Innovation Program Spoke Support & Training 	 Tender Funds Allocation MGMT
 R&I Program Reporting 	 Tender Monitoring Deployment
 Tendering Procedures & Planning 	 Accounting & Administration
Tender Pipeline Planning	 Acconting & Administration Planning
 Tender Process Deployment 	 Accounting & Administrative Processes
• Tender Monitoring - Accountable FO	Accounting Reporting
T Officer	Communication&Public Engagement Office
• FRP Implementation	Communication Management
ERP Implementation Development plan	Communication Management Communication Plan & Budgeting
ERP Implementation Oevelopment plan System development	Communication Management Communication Plan & Budgeting Communication Processes
ERP Implementation Overlopment plan System development Evaluation & Uparade	Communication Management Communication Plan & Budgeting Communication Processes Budget Monitoring and Impact Evaluation
ERP Implementation Overlopment plan System development Evaluation & Upgrade CMS & Collaborative Systems	Communication Management Communication Plan & Budgeting Communication Processes Budget Monitoring and Impact Evaluation Public Engagement Action
 ERP Implementation Development plan System development Evaluation & Upgrade CMS & Collaborative Systems Development plan 	 Communication Management Communication Plan & Budgeting Communication Processes Budget Monitoring and Impact Evaluation Public Engagement Action Engagement Roadmap Planning
 ERP Implementation Development plan System development Evaluation & Upgrade CMS & Collaborative Systems Development plan System development 	 Communication Management Communication Plan & Budgeting Communication Processes Budget Monitoring and Impact Evaluation Public Engagement Action Engagement Roadmap Planning Engagement Event Management

• HUB SLA Upgrade

- Engagement Impact Evaluation

The processes thus identified are further exploded into (third-level) Macro-Tasks, which can be allocated over time with precise criteria which include: 1. start, end, repetition, and duration of the task; 2. task effort dimension&dynamics (one-off vs recurrent); 3. responsibility; 4. outcome-milestones; 5. main constraints; 6. main risk.

Below is an example table of the Macro-Tasks for the processes under the responsibility of the Innovation Program Officer and the 3-year GANTT is attached, complete with all the Macro-Tasks provided for by the structure of the starting processes.

		Innovation Program Officer	
MP1		Innovation Program Analysis and Evaluation	n
MP1.1	R&I Master Plan Assessment	MP1.2 Innovation Program Spoke Support & Training	MP1.3 R&I Program Reporting
MP1.1	.R&I Spoke Program Needs Analysis Updating	MP1.2.Spoke Support Process Engineering	MP1.3.Spoke R&I KPIs Assessment
MP1.1	.R&I Plan agreement per Spoke	MP1.2.Spoke Support Organization	MP1.3. Spoke R&I Monitoring Process Engineering&Agreement
MP1.1	.R&I Master Plan Definition & Discussion	MP1.2. Spoke Support SLA Assessment&Updating	MP1.3. HUB R&I KPIs Process Integration
MP1.1	.R&I Master Plan Presentation & Communication	MP1.2. Exploitation Research Training	MP1.3. HUB Monitoring System Reports Delivery&Presentation
		MP1.2. Spoke Entrepreneurial Research Training Programs	
MP2		Tendering Procedures & Planning	
MP2.1	Tender Pipeline planning	MP2.2 Tender Process Deployment	
MP2.2	.Spoke R&I Program Resource Planning	MP2.2. Tender Process Engineering	
MP2.2	Tender Pipeline Presentation	MP2.2. Tender Procedures Definition	
		MP2.2. Legal Check on Tender Programs	

The GANTT reports 3-level programming - Mega Processes, Major Processes, and Macro-Task - with a weeklevel granularity, and over time represents the main milestones to be achieved in the implementation of each of the identified and programmed processes.

Below is an example excerpt of the main Milestones placed over time for each process, at the quarter level, with an indication of the estimated effort for the implementation of each planned process.





			Vear	1
			Semester	1 2
			Quarter	1 2 3 4
			Working Effort (weeks)	
MP1	Innovation Program Analysis and Evaluation	Outcomes-Milestones	177	
MP1.1	R&I Master Plan Assessment	R&I Master Plan Process shared with Spokes	73	
MP1.2	Innovation Program Spoke Support	Spoke SLA Implmentation&Upgrading	44	
MP1.3	R&I Program Reporting	R&I Scorecard HUB&Spoke Integration	60	· · · · · · · · · · · · · · · · · · ·
MP2	Tendering Procedures & Planning		119	
MP2.2	Tender Process Deployment	Tender Procedures Communication	71	
MP2.1	Tender Pipeline planning	Tender Program Definition & Presentation	48	
MP3	Tender Execution & Monitoring	Live Tender System Execution	60	
MP3.1	Tender Monitoring Deployment		36	
MP3.2	Tender Funds Allocation MGMT	Tender Funds allocated to the Spokes	24	
MP4	Accounting&Administration	Assessmentian R. Advalationation Descent Descharger	214	
MP4.2	Accountin&Administrative Processes	Accounting & Administrative Process Deployment	46	
MP4.1	Acconting&Administration Planning	Accounting&Administrative HUP Master Plan	96	
MP4.3	Accounting Reporting	Major Accounting&Administrative Report Implement	72	
MP5	ERP Implementation		288	
MP5.1	Development plan	ERP System Requirements Acquisition	48	
	Cutor development	FRR Contract Development		
IVIP5.2	system development	ERP System Deployment	130	
MP5.3	ERP implementation evaluation & Upgrade	ERP System Features Upgrade	104	
MP6	CMS & Collaborative Systems		144	
MP6.1	Development plan	Collaborative System Requirements Acquisition	36	
MP6 2	System Development	Collaborative System Deployment	26	
1111 0.2	System Development	condorative system beproyment		
MP6.3	HUB SLA for Spokes	Collaborative Working SLA Upgrade	72	
MP7	Communication Management		585	
MP7.1	Communication Plan & Budgeting	Communication Budgt Presentation	60	
MP7.2	Communication Processes Execution	Communciation Office Organization	330	
MP7.3	Budget Monitoring and Impact Evaluation	Reports&Budget Updating	195	
MP8	Public Engagement Action		139	
MP8.1	Engagement Roadmap Planning	Public Engagement Plan	54	
			-	
MP8.2	Engagment Event Management	PE Event Roadmap	45	
MP8.3	Public Engagement Impact Evaluation	PE Evaluation	40	

At a subsequent level of detail, the GANTT represents all the Macro-Tasks for each Major Process, reporting their main characteristics in terms of programming. Below is an excerpt of the Macro-Tasks highlighted for the Training and the Dissemination activities, in which it is possible to better appreciate the inter-functional collaboration between the Innovation Program Officer and the Publica Engagement Officer.



The deepening of the Training and Public Engagement processes in Macro-Task highlights the strategy with which the Hub, on the one hand, develops and accelerates the skills available in the spokes on the enhancement of research results; on the other, it connects the potential of research generated by the Ecosystem with the stakeholders of the area through a constant and coordinated action of Public Engagement.

Specifically, the Hub schedules an International Conference a year aimed at generating Exploitation, Dissemination, and Communication of the results of the Spoke research, lasting three days during which meetings and round tables are promoted on the innovation trajectories of the Ecosystem. To complete this central moment in the Public Engagement Strategy, the Hub organises other two actions: a quarterly *co*-



development and Dissemination workshop program aimed to generate opportunities for synergy with the stakeholders of the territories with industrial and social impacts; an action of *Promotion and Dissemination based on TTOs* and in general, the main Stakeholders engaged in the third mission.

The execution of the Public Engagement program is supported by continuous training programs (quarterly) for students and researchers (PhD students and research fellows, researchers, etc.) by the Innovation Program Officer in two areas:

- 1. a training program on the Exploitation of research results aimed at the promotion and co-design of *Open Innovation* processes;
- 2. an entrepreneurial training program, which leverages the Startup & Spinoff Building opportunities, through a *Lean and Problem-Driven Approach* on core innovation trajectories for the Ecosystem.

Hub Key Performance Indicators

- 1. The processes and related Milestones form a *Strategic Map* of development options in which the *strategic success factors* and related KPIs are defined.
- 2. The Strategic Map identifies the relationships between the Hub's objectives, processes, and functions to form a systematic framework for choosing the most relevant KPIs. Below is a matrix containing the strategic success factors for the HUB, seen from the perspectives of a Strategic Map consistent with the functions of the Hub:

	Innovation Officer	Financial Officer	IT Officer	Comm. & P/E Officer
Financial Perspective	R&I Budget Planned	Tender Funds Delivery	IT Infrastructure Budget	Communication&P/E Budget
	Tender Funds Planned	Financial and Economic Efficiency		
	N° of active innovation program supported			
Spoke Engagement Perspective	# Technology transfer carried out	Spoke participation to Tender Flow	SLA It systems for Spokes	N° of events supported per Spoke
	Enhance Inernational Collaboration			Enhance R&I Visibility
			Technological Alignment of the Spokes	
Operations Perspective	N° of days of training&support for Spokes	N° of Tenders delivered at the same time	Time to implement IT features required	Communciation Impact
	N° of tenders planed	Tme-to-delivery Funds	Data Services	
	Management of The Workflow			
Learning&Growth Perspective	N° of researchers engaged	TECH4You Impact Assessment	Remote Access	N° of stakeholders engaged
	Training Delivery			

The matrix highlights the most relevant strategic success factors for the set-up phase, for which consistent KPIs have been identified as reported in section C.9.

For the complete implementation of the activities described above, a total cost of \in 5.953.000 is expected, structured, according to eligible expenses, as in the table below.

Cost item	Amount
Personnel costs	€ 2.788.656
Equipment and licenses costs	€ 170.000
Subcontracting costs	€ 997.180
Costs for buildings and land	€ 1.300.000
Management and administrative costs	€ 278.866
Indirect costs	€ 418.298
Total	€ 5.953.000

As illustrated, the costs envisaged for the hub also include costs for "buildings and land". The University of Calabria will make available up to 5 years after the conclusion of the project for the location of the headquarters of the Hub the building, called "La Torraccia", located in Santo Stefano di Rende, which will be specially renovated to make it suitable to host the operational headquarters of the Hub.

The hub will have the legal form of a public consortium (SCARL in Italian law) with the four universities, the two Regions and the CNR, which together will hold 90% of the share capital.

Relationships within the Hub will be governed, in addition to the relevant laws and the Grant Agreement signed with the Ministry of University and Research, also by internal regulations. The relationships with the Spokes, instead, will be regulated by specific partnership agreements. These agreements will regulate in detail, among other things, the following aspects: commitments; decision-making processes; roles; accountabilities; information flows (reporting); monitoring actions.



Finally, for the sake of completeness, it should be noted that partnership agreements will also be drawn up to regulate relations between spoke and its affiliates, to better manage both the technical aspects (implementation and monitoring of research and innovation activities) and the administrative and reporting ones.

C.3) Operational units involved

Tech4You program involves several operational units (26 University departments, more than 20 labs, 5 Research Infrastructure (4 Calabria (STAR, SILA, Biomedpark@UMG, SAF@MED) and 1 Basilicata (IRPAC), 5 Regional Research Centres (ISM, ITM, IIA, ICAR, IN), 2 regional Agency for the environment and 1 National Department for the Geological Service; 5 technological platforms (Functional genomics, Proteomics and stem cell biology; Neuroscience; Pharmacology; Imaging of the Body Districts).

C.4) Work plan

The Tech4You R&I program plans to help communities become resilient to climate change and foster economic growth by turning a problem into a resource. The work plan described below is part of a general vision on the theme of climate change, which today, due to the dramatic nature of its evolution, would be more correct to call "climate breakdown". Tech4You aims to induce structural, technological and cultural changes, in the approach to this problem that every day that passes becomes more pressing.

Spoke 1 - Circular technologies to mitigate geo-hydrological and forest fire risks				
Leader: CNR	Affiliated: Unical, Unibas, Unirc	Budget	€ 21.807.775	
Coordinator: Tommaso Moramarco (CNR)				

Mission of the Spoke: make available innovative solutions for a sustainable development of communities, taking into account the ongoing climate impact. In line with the specific goals of the Tech4you program "*mitigation natural risk*" (SO1), it will contribute to reaching multiple SDGs with the most direct impact on SGS10 (Reduce inequalities), SDG 11 (Sustainable Cities and Communities), SDG 13 (Climate Action), and SDG 15 (Life on land). The research activities proposed by Spoke's coordinator fit with the scientific expertise of the involved research groups to a) increase territorial safety and mitigate natural risk by simulating the landslide mechanisms, taking into account the ongoing climate change scenarios and different scales of analyses; b) enhance flood risk prevention; c) improve environmental management. The use of an early warning system represents one of the most important non-structural interventions for the reduction of hydrogeological and hydraulic risk, in full compliance with the DNSH principle.

Target group: Citizens, Municipalities, Regional Government, Territorial Agencies (national parks, environmental agencies, etc.), ICT companies, early warning management companies, safety managers.

G1.1 Technologies and innovative multi-scale tools for landslide risk prevention

Goal Leader: Nicola Moraci (CNR) – Full Prof. of Geotechnics

Activity Plan: a) multi-scale, interoperable and upgradeable databases; b)integrated and interdisciplinary digital multi-scale tools and their circular updating for transferring knowledge; c)multi-scale demonstrators to validate and develop databases and tools, advanced sensors and integrated systems for landslide risk management; d)digital tools for designing circular, multi-scale and interdisciplinary methodological paths for the definition of phenomenological models of typified landslides; e)multi-scale digital tools for the quantitative assessment of landslide risk to support the choice and design of prevention actions; f) digital protocols for the use and/or the specific implementation of multi-scale demonstrators.

Pilot Projects	Outputs, Milestones and indicators for the ex-
	post evaluation
 Multi-scale and interdisciplinary on-site laboratories as demonstration systems and knowledge generators in decision support for the management of landslide risk (adaptation, mitigation, reduction). (Coordinator: Roberto Coscarelli, CNR) Methods and tools for quantitative modelling of diffuse and local landslides, aiming at planning, scheduling and designing of landslide risk adaptation, mitigation and reduction (Coordinator Nicola Moraci, Unirc) 	 Platforms tested on advanced quantitative models able to simulate landslide mechanisms also taking into account the ongoing climate change scenarios and different scales @M36 Digital tools for the defining phenomenological models of typified landslides (dimensions, kinematics, geomaterials, etc.) @M12; quantitative





landslide risk assessment @M24; multi-scale demonstrators @M36

G1.2

Models, technologies and innovative tools for prevention and identification of hydraulic and geo-hydrological risks at basin and urban scales.

Goal Leader: Aurelia Sole (Unibas) – Full Prof. of Hydraulics, Hydrology, Hydraulic and Marine Constructions

Activity Plan: 1) Climate Services to support the planning and management of risk phenomena: a) Weatherhydrological coupled modelling; b) hydrological - hydraulic coupled modelling; c) Fluid-structure interaction modelling; d) Monitoring of flood areas in sample basins; e) Flood propagation models implemented in sample warning areas; f) Integrated modelling with advanced sensors for urban runoffs and flood control; g) Implementation of user-friendly systems (app) for the issue of critical issues; h) Innovative techniques for monitoring; i) Nature-Based Solutions for Risk Reduction; j) Short and medium-term weather forecasting systems; 2) Real-time forecasting systems with: a) artificial intelligence techniques and smartphone communication, fluid-structure interaction phenomena for the assessment of structural vulnerability in the presence of flood events multi-scale, interoperable and upgradeable databases; b) integrated and interdisciplinary digital multi-scale tools and their circular updating for transferring knowledge; c) multi-scale demonstrators to validate and develop databases and tools, advanced sensors and integrated systems for landslide risk management; d) digital tools for designing circular, multi-scale and interdisciplinary methodological paths for the definition of phenomenological models of typified landslides; e) multi-scale digital tools for the quantitative assessment of landslide risk to support the choice and design of prevention actions; f) digital protocols for the use and/or the specific implementation of multi-scale demonstrators.

	Pilot Projects		Outputs, milestones and indicators for the ex-post evaluation
1.	Multi-scale Early Warning System for the operational management of hydrological and hydraulic risk (coordinator: Lorenzo Marchi, CNR)	•	Definition of the fundamental characteristics of the different components of the system @M12; system to be used to support decisions and procedures for system evaluation and definition of the audit-ready and tested in an operational environment@M36; Pilot validated at TRL7 @M36 Definition of flood risk in urban areas models and early warning models chain also using AI @M24 Implementation of web-GIS portal for flood early warning system and in situ deployments of pilot prototipe@M36 TRL 8
2.	Innovative methods and tools for the research, the quality- quantitative assessment and protection to pollution of the fissured aquifers' strategic groundwater resources of the Lucanian and Calabrian Apennines (Coordinator: Francesco Sdao, Unibas)	•	Aquifer hydrogeological characterization Assessment of intrinsic vulnerability. Numerical modelling of the aquifer systems under study. @M12.Design and implementation of a groundwater quality monitoring system. @M18 TRL 7. Web-Gis realization of Identification and definition of protection zones for the recharge areas and springs with particular reference to strategic water resources. @M18 Complete Web-Gis platform with DSS @M36 TRL 7 Membrane prototypes for the purification of contaminated waters from toxic pollutants (e.g. arsenic, hexavalent chromium, fluorine, etc.)@M36
3.	System for Risk Analysis and Forecast for Critical Infrastructures (hydraulic and road network)(Coordinator Mario Maiolo, Unical)	•	Decision support system@M12; Tools to monitor the resilience of the hydraulic structures@M24; Innovative tools for the safety of road-crossing and road network infrastructures (combined landslide and hydraulic risk) @M36
4.	Predictive models to estimate flash floods and soil losses (Coordinator Giuseppe Bombino, Unical)	•	Machine and deep learning processes, indicators and models of flash floods (also by using dendrochronological analysis) and soil loss @M12 (reaching TRL4). platform IoT-based to support the public and private Actors/Authorities and Stakeholders will be created at M36 (reaching TRL6)
5.	Systemformonitoring,forecasting,warningand drought	•	Key technologies for drought risk monitoring, hydro- meteorological short- and long-range forecasting system developed





	risk management (Coordinator	6	and tested @ Pilot demonstrator covers at least 1 end-users and
	Alfonso Senatore, Unical)	5	sites and validated at TRL7 @M36
6.	Integrated and multidisciplinary	•]	Key technologies Framework to meet the needs of the report on
	framework for the management of	ł	binding certification and environmental authorization developed
	environmental sustainability	8	and tested @M12; Technologies integrated with the pilot
	regulations (Coordinator,	(demonstrator@M24; Pilot demonstrator covers at least 1 end-user
	Maristella Amisano, Unical)	8	and site and validated at TRL7 @M36

G1.3 Models, technologies and innovative tools for identification and prevention of coastal erosion risk

Goal Leader: Mario Maiolo (Unical) – Associate Prof. of Hydraulics, Hydrology, Hydraulic and Marine Constructions

Activity Plan: a) implementation of platforms for Early Warning, to predict damages and identify mitigation techniques for coastal erosion; b) implementation of numerical methods and models for extreme wave event forecasting, and wave measurement systems for erosion risk mitigation; c)integration to quantify natural sediment delivery to river mouths by measuring the resulting shoreline evolution.

Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation
 Advanced satellite and in situ monitoring techniques for coastal erosion assessment and innovative solutions for coastal protection and beach nourishment (Coordinator Manuela Carini, Unical) Early Warning system for coastal erosion risk through advanced measurement and monitoring systems (Coordinator Felice Arena, Unirc) 	 Key technologies tested @M12; Technologies integrated into the pilot demonstrator@M18 Pilot demonstrator covers at least 5 sites @M30; At least 30 end-users engaged in pilot demonstration @M36; Pilot validated at TRL7 @M36

G1.4 Models, technologies and innovative tools for mitigation and prevention of forest fire risk.

Goal Leader: Fabio Lombardi (Unirc) - Associate Prof. of Forestry and Selvestry

Action Plan: The extent of forest fires, even if human-induced, is strongly influenced by the weather and climatic conditions, but also by the soil moisture. Fire spread models and software will support the emergency activities, also creating forecasting tools based on high-resolution atmospheric models for assessing the effectiveness of silvicultural practices on forest fire prevention. Through the identification of pilot areas: a) estimating the fuel and fire severity, (b) monitoring the post-fire vegetation dynamics, (c) evaluating the effects of forest fires, (d) demonstration sites for evaluating the effectiveness of silvicultural practices, (e) Forest fire modelling can be based on spatiotemporal probabilistic spread models, already developed in other frameworks, (f) Multi-sensor monitoring systems with robust satellite techniques (RST).

Pilot projects	Output, milestones and indicators for the ex-post evaluation
1. Multi-sensor monitoring systems and robust satellite techniques (RST) for forest fire risk warning (Coordinator Giuseppe Mendicino, Unical)	 Key technologies developed and tested @M12; Technologies integrated into the pilot demonstrator@M24; Pilot demonstrator covers at least 1 end-users and sites and validated at TRL7 @M36. Algorithms and models improvement and preliminary testing (Robust Satellite Technique-Fires, POD, dynamical-statistical analysis, burned mass and emissions estimates) @M24; Final test and integration in a real-time decision support system @M30.
2. Multidisciplinary experimental and demonstration sites for the study analysis monitoring and	• Machine and deep learning processes, using indicators and models for multi-temporal and multi-scale analysis of fuel and fire severity @M12 testing innovative silvicultural practices



	quantification of the ecological		for reducing the extent of forest burned per year@M24
	and environmental effects of		developing a prototype monitoring system able to detect post-
	forest fires (Coordinator Fabio		fire hillslope processes and to measure geo-hydrological
	Lombardi, Unirc)		parameters related to their triggering @M24 (TRL 4) testing
			prototype monitoring system in the selected study sites
			affected by post-fire geo-hydrological processes @M24 (TRL
			5) platform <i>IoT-based</i> to support the public and private
			actors/authorities and stakeholders will be created at @M36
			(reaching TRL 6).
3.	PP1.4.3 Probabilistic space-time	•	Key technologies platform to integrate models of forest fire
	models for forest fire spreading		spreading developed and tested @M12; Technologies
	(Coordinator Roberto Beneduci,		integrated into the pilot demonstrator@M24; Pilot
	Unical)		demonstrator covers at least 1 end-users and sites and

Spoke 2 - Technologies to reduce energy consumption and save biodiversity					
Leader: Unical	Affiliated: Unibas, Unirc, CNR, ARPACAL, Istituto	Budget	€ 28.601.045		
	Superiore per la Protezione e la Ricerca Ambientale				
	(ISPRA), EIT Manufacturing SRL, RINA Consulting –				
	CSM SpA, Techfem SpA				

validated at TRL7 @M36

Coordinator: Maurizio Muzzupappa (Unical), Full prof. in Design and methods of industrial engineering

Mission of the Spoke: Research activities under this cluster will enable the transition to a neutral climate that promotes community resilience, and contributes to biodiversity conservation. In line with the specific goals of the Tech4you program "*reducing energy needs and saving biodiversity*" (SO2), it will contribute to reaching multiple SDGs with the most direct impact on SDG 7 (Affordable and clean energy), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action), SDG 12 (Responsible production and consumption), and SDG 14 (Life below the water). The scheduling research activities have been proposed by Spoke's coordinator and perfectly fit with the scientific expertise of involved research groups to a) build renewable communities towards energy self-sustainability by new renewable energy sources (scraps and urban wastes, use of conventional RES in the high energy-intensive sector, distributed storage systems (conventional and hydrogen and e-chemicals based); b) increase the protection, enhancement of the marine coastal system and for the safeguarding of biodiversity; c) increase waste recycling with lower energy consumptions and CO2 emissions and enhance e disassembly of WEEE waste recycling lithium batteries; d) more sustainable and integrate eco-mobility management in urban/suburban areas.

Target group: Citizens as consumers will be involved in all stages of the implementation so that they can be co-creator of the same community; Municipalities, Regional Government; Energy companies, manufactured companies, public transport services.

C2 1	Technological solutions for the deep decarbonisation of the energy system and the reuse
G2.1	of scraps and waste

Goal Leader: Anna Pinnarelli (Unical) - Assistant Prof. of Electric Power System

Activity Plan: a) Smart grid solutions: pilot-scale renewable community integrating RES plants (optimized PV plant, U-OWC plant for the production of green energy in a coastal environment, biofuel supplied co-generation plant), innovative storage systems (H2_storage, power to water), favoring innovative waste and scrap recycling processes and a bio-mobility; b) Innovative solutions in buildings: innovative integrated technological solutions and systems for the building envelope in terms of thermal performances and effect on the building to improve the efficiency of conventional green roofs in terms of water and electricity consumption, and increase the building energy efficiency through the integration of air conditioning and recirculation systems with indoor pollution monitoring systems; c) Waste to Hydrogen and Green fuels: a pilot-scale plant to storage the RES daily surplus of the renewable community in the form of chemical energy by enhancing the organic fraction of solid urban waste and implementing techniques for the disposal of residual fractions of waste treatment and purification sludge with so-called characteristics. End of Waste, further improving its sustainability with the elimination of CO2 emissions; d) digital solutions for the user engagement where the users of the renewable community are heavily involved in all design stages, becoming co-developers and creators.



G2.2



	Pilot Projects	0	utputs, milestones and indicators for the ex-post evaluation
1.	Smart grid solutions (hybrid energy systems, power to biofuels and power to power, bio mobility), renewable community and user engagement (Coordinator Daniele	•	1/2-Key technologies tested @M12; Technologies integrated into the pilot demonstrator@M18; Pilot demonstrator
2.	Innovative solutions in buildings for water-energy saving and optimisation of the integrated water-energy cycle (Coordinator: Natale Arcuri – Unical)		covers at least 10 end-users and sites @M30; At least 30 end-users engaged in pilot demonstration @M36; Pilot validated -TRL7 @M36
3.	Hydrogen Mediated Waste to «Green Fuel» (Coordinator Girolamo Giordano, Unical)	•	3-Pilot covers one site @M30 and demonstration -TRL7 @M36

Techniques and tools for the protection and enhancement of the marine coastal system

Goal Leader: Giuseppe Mendicino (Unical) – Full Prof. of Hydraulic And Maritime Constructions And Hydrology

Activity Plan: a) Validation of innovative membrane to prevent and reduce sea pollution by improving wastewater processes and plant: (1) Membrane Distillation-Crystallization technology, powered by solar energy to recover Magnesium and Lithium (both included in the 2020 EU list of Critical Raw Materials) by mining seawater desalination brine; (2) integrated membrane system, combining MF, UF and NF, for the recovery and fractionation of the micro- nano-plastics, with a photocatalytic process for their degradation on-site; (3) innovative prototypes in purification systems, based on integrated technologies; (4) innovative membrane systems for industrial wastewater; (5) innovative membrane to desalinate seawater; **b**) early warning system by remotely control of water quality (sea, coastal and river) to prevent sea pollution and to save biodiversity: a complex prototype system based on Wireless Sensor Networks (WSN) in a coastal site of interest by deployable multiparametric sensor nodes, integrated with Unmanned Aerial Vehicles (UAVs) equipped with microwave sensors, for water quality monitoring and early warning detection of intentional microbial or chemical contamination of water.

	Pilot Projects	Outputs, milestones and indicators for the
		ex-post evaluation
1.	Prototypes of innovative membrane for water purification	Key technologies tested @M12; Development
	and protection of sea resources	of prototypes @M18; Pilot demonstrator covers
	(Coordinator Vincenza Calabrò, Unical)	at least one site @M30; At least 30 end-users
2.	Integrated systems for controlling the evolution,	engaged in pilot demonstration @M36; Pilot
	sustainability, and safety of coastal systems (Coordinator	validated at TRL7 @M36
	Roberto Gaudio, Unical)	

G2.3 Safeguard and enhancement of Biodiversity

Goal Leader: Rosanna De Rosa (Unical) – Full Prof. of Geochemistry and Vulcanology

Activity Plan: a) validation of innovative solutions to monitor the underwater and terrestrial environment through the integration of methodology, tools and on-site data (survey, mapping, and monitoring of natural habitats to analyse the ecosystems and recognize substrates and biocenosis); b) integration of robotic and AI-based computer vision technologies for 3D reconstruction, sampling, and mapping of marine bio constructions; c) test a useful operating tool for peoples and institutions involved in biodiversity management, by providing an effective means for identifying conservation priorities as well as gaps in basic biodiversity knowledge.

	Pilot Projects	Outputs, milestones and indicators for the ex-
		post evaluation
1.	Tools and applications for integrated marine	Key technologies tested @M12; Technologies
	communities and substrates monitoring (Coordinator	integrated into the pilot demonstrator@M18;
	Elvira Brunelli, Unical)	Pilot demonstrator covers at least 5 end-users and
2.	Operational protocols and tools for the conservation and	sites @M30; At least 30 end-users engaged in
	sustainable use of terrestrial ecosystems (Coordinator	pilot demonstration @M36; Pilot validated at
	Nicodemo Passalacqua, Unical)	TRL7 @M36





G2.4 Advanced Systems and Technologies for the REuse of secondary raw materials from BATtery recycling

Goal Leader: Gregorio Cappuccino (Unical) – Associate Prof. of Electronis

Activity Plan: a) a real plant-based on scalable technologies for the treatment of lithium batteries from the disassembly of WEEE waste and other technological sectors; b) a toolbox for the rationalization of a system of legal assistance and support in the context of the reuse of raw and secondary materials through the automatic generation of control trails with artificial intelligence applications, to certify the process for the circular economy.

	Pilot Projects	Ou	tputs, milestones and indicators for the ex-post evaluation
1.	Advanced systems and technologies for the reuse of secondary raw materials from battery recycling (Coordinator Gregorio Cappuccino, Unical)	•	Key technologies and systems developed @M12; Key technologies and systems tested @M20; Pilot demonstrator consisting of one prototype@M30; Pilot validated at TRL7 @M36
2.	Integration of legal instruments for the circular economy and environmental sustainability of the secondary raw materials reuse (Coordinator Maristella Amisano, Unical)	•	Definition of the fundamental characteristics of the different components of the system @M12; system to be used to support decisions and procedures for system evaluation and definition of the audit-ready and tested in an operational environment@M36; Pilot validated at TRL7 @M36

G2.5 Technologies and methodologies supporting low-cost, eco-friendly and pervasive ambient monitoring and eco-mobility management in urban/suburban areas

Goal Leader: Floriano De Rango (Unical) - Associate Prof. of Telecomunication

Activity Plan: a) IoT solutions to monitor air pollution in the public transportation systems, and to track the renewable resource availability (wind, photovoltaic, hydrogen and geothermal); b) a low-cost pervasive ambient monitoring system and vehicle tracking to reduce CO2 for more eco-sustainable management of urban/extra-urban mobility; c) Decision Support System on not-programmable energy resource to retrieve geothermal energy potential.

Pilot Projects	Outputs, milestones and indicators for the ex-post
	evaluation
 IoT solutions and ambient monitoring and control systems (atmospheric, acoustic, electromagnetic pollution) in the south of Italy integrated to a multi-modal eco-mobility (Coordinator Floriano De Rango, Unical); Digital platform and IoT solutions for monitoring the potential in terms of renewable resources in the Southern Italian Regions (Coordinator Rosanna De Rosa, Unical) 	 IoT solutions tested @M12; IoT solutions integrated into the pilot demonstrator@M18; Pilot demonstrator covers at least 30 public transport vehicles @M30; At least 100 end-users engaged in pilot demonstration @M36; System completed and qualified at TRL8 @M36 IT tool/platform developed and tested @M12; Pilot demonstrator covers at least 10 sites @M30; Platform completed and qualified at TRL8 @M36

Spoke 3 - Smart technologies for sustainable food supply chain and forestry					
Leader: Unirc	Affiliated: Unical, Unibas, CNR,	Budget	€ 22.000.000		
	CREA, TIM				
~					

Coordinator: Giovanni E. Agosteo (UNIRC), Associate Prof. in Plant Pathology

Mission of the Spoke: Climate change can disrupt food availability, reduce access to food, and affect food quality due to extreme heat, severe weather, and droughts. In line with the specific goals of the Tech4you program *improvement sustainable foods* (SO3), it will contribute to reaching multiple SDGs with the most direct impact on SDG 1 (No poverty), SDG 2 (Zero hunger), SDG 10 (reduce inequalities), SDG 13 (Climate Action), and SDG 12 (Responsible production and consumption). The scheduling research activities have been proposed by Spoke's coordinator and perfectly fit with the scientific expertise of involved research groups: a) to optimize farming and to transition towards more sustainable agriculture, and to deepen, in the Mediterranean environment, the knowledge of the adoption of precision farming in the context of the agroecological transition



of agricultural production systems, providing a factual reference model of Mediterranean Climate-Smart Agriculture; b) to create solutions that can be easily adapted to different realities, providing real-time information on crops, soil, and livestock status; c) increase of both resilience and wood quality in Mediterranean forests, and support the forest economy, promoting the *wood supply chain*; d)improve water management resources for high-productive agricultural Basilicata and Calabria ecosystems to optimize their efficiency, to increase their productivity, quality of the products and to reduce the water footprint; e) to improve crop performance and stress resistance.

Target group: Farmers; municipalities, citizens, food supply companies, agricultural associations, agroindustrial companies.

G3.1

AGRICULTURE AND LIVESTOCK SMART FARMING

Goal Leader: Giovanni Agosteo (Unirc) - Associate Professor of Plant Pathology

Activity Plan a) to deepen, in the Mediterranean environment, the knowledge of the adoption of precision farming in the context of the agroecological transition of agricultural production systems, providing a factual reference model of Mediterranean Climate-Smart Agriculture.; b) to help the integration of smart technologies into the Mediterranean farming systems. This will have positive impacts on the economy by optimizing production workflows, on-farm sustainability by reducing the most impactful agricultural practices, and on society by guaranteeing food safety and security. The goal aims to leverage state-of-the-art technologies (IoT, 5G, UAVs, multispectral imaging, meta-omics, nanopore DNA sequencing, cloud computing, etc.) to create solutions that can be easily adapted to different realities, providing real-time information on crops, soil, and livestock status. Farmers will be supported in their decisions by smart systems that work and integrate automatically into a digital platform, contributing to optimizing farming and to transition towards more sustainable agriculture.

Pilot projects	Outputs, milestones and indicators for the ex-post evaluation
1. Targeting precision farming applications to agroecological	• Instrumental platforms and established analytical protocols (physical, chemical, biochemical, and molecular) for plant and soil characterization and soil functioning evaluation
intensification (Coordinator Giovanni Agosteo,	• Remote sensor and model and network analysis will be used to identify the key connections between organisms under the different organic systems across experimental sites
Unirc)	• Monitor of origin of genotypes adopted in cropping systems (traceability) and the selection of tolerant genotypes
	• Plug-n-play platform to track plant and soil health plant pathogens from environmental DNA;
	• IoT-based solutions and advanced robotics automatizing the handling and packaging of fruit and vegetables
	• System qualified of semi-transparent photovoltaic generator with mono-axial solar tracking, (patent registered)
	• sensors and devices will be used to monitor the health of small ruminants @M12; test in an existing farm located in Basilicata @M18
	• smart agriculture platform based on the recent ICT technologies, such as the internet of things, virtual and augmented reality, 5G/6G communication systems, artificial intelligence, robotics @M36

G3.2 Smart forestry and resilience: advanced models for sustainability of agroforestry supply chains

Goal Coordinator: Giuseppe Bombino (Unirc) – Associate Professor of Agricultural, Hydraulic and Hydraulic-forestry systems

Activity Plan: The SFM will pursue the objective of combining the conflicting needs of preserving the ecological and relational functionality of forests (an increase of deadwood amounts, stand tree age, wood quality and biodiversity) and rising the resilience of forests (against biotic and abiotic adversities and extreme events) because of withdrawals and silvicultural interventions aimed at supporting the forest multifunctionality, enhancing the *wood supply chain*. The SFM will be able to; (a) share quantitative information, (b) optimize the



use of human and financial resources, and (c) investigate activities before the implementation of actions to mitigate and control any undesirable effects following extreme events and anthropogenic disturbances.

lot Projects	Outputs, milestones and indicators for the ex-post evaluation	
Sustainable Forest	• advanced system of computerized traceability of the forest supply	
Management (SFM) and	chain through Blockchain silvicultural management models	
Resilience (Coordinator Fabio	• Platform to assess the status of forests and alert (integrating the use	
Lombardi Unirc)	of drones, field sampling, and environmental DNA). Samples will be	
SFM and Wood Quality	processed using an automatic workflow, enabling repeatability of	
(Coordinator Andrea Proto,	each analysis, and the environmental DNA will be sequenced using	
Unirc)	Nanopore technology, which allows matching sequencing results	
FOREST HEALTH	with a reference database in real-time using cloud computing	
(Coordinator Maria Giulia Li	platforms.	
Destri Nicosia, Unirc)	TRL4@M12; TRL5@M24; TRL6@M36	
	lot Projects Sustainable Forest Management (SFM) and Resilience (Coordinator Fabio Lombardi Unirc) SFM and Wood Quality (Coordinator Andrea Proto, Unirc) FOREST HEALTH (Coordinator Maria Giulia Li Destri Nicosia, Unirc)	

G3.3	Smart Water

Goal Leader: Bartolomeo Dichio (Unibas) - Full Professor of General Arboriculture and tree

Activity Plan: Water is a key resource not only for agriculture but also for potable and industrial sectors creating further uncertainties. To cope with this scenario innovation are required at basin and field scales to support water managers and improve water use efficiency. This proposal will introduce: (i) innovative technologies for the management of irrigation body water at basin scale; (ii) parametrize environmental variables supporting improvement definition of crop water requirements. Precision irrigation at remote and proximity (IoT networks) scales will be introduced for new efficient irrigation protocols. Those outcomes will feed developing water footprint labelling for environmental traceability.

Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation			
 Valorization and management models of water resources in high- value crop systems (Coordinator Bartolomeo Dichio, Unibas) 	 Experimental site multiple (IoT) sensors will be linked to the main hub for remote access, data storage and post-processing results @M12 Network of series of IoT sensors installed and connected for continuous and real-time monitoring of the environmental and plant parameters TRL7@M18 Technologies for the management of irrigation body water resources and supply networks (irrigation, potable, industrial).; mapping of environmental variables and selection of adequate irrigated land-use @M12 Digital and plant-based methods for the definition of crop water requirements based on agronomic and physiological, yield and quality targets @M18 Remote models (satellite, drone) and proximity (IoT networks) scales for monitoring of plants and soil features @M36 Platform and digital networks of irrigation, crops and environmental related data to support water managers and growers at different scales TRL8@M36 			

G3.4

SMART FOOD FACTORY FOR SUSTAINABILITY

Goal Leader Maria Teresa Russo (Unirc), Associate Prof. of Food Chemistry

Activity Plan: a) Creation of a smart FOOD FACTORY model based on the creation of an intelligent food factory in Calabria for the development and evaluation of new technologies; b) Release of the Agritech smart factory platform for the management of smart factories.;c) Integrated blockchain traceability system for the agri-food chain management.; d) Development of blockchain platform integrated with ICT solutions to support authenticity, traceability, waste monitoring, and transparency of products along all agri-food chains.

Pilot Projects	Output, milestones and indicators for the ex-post evaluation	
Food processing (Coordinator Marco Poiana, Unirc)	 Design of smart agri-food buildings @M12; Predictive model and IoT system to manage the foodstuffs; @M24 New material for biodegradable packaging and edible coatings for the extension of the shelf life of food @M18 	



	 integrate sensors and internet-of-things (IoT) to monitor the breeding of insects to produce protein for food and feed @M36 TRL5@M12; TRL6@M24; TRL7@M36
Advanced modelling of food industry processes (Coordinator Stefano Curcio, Unical)	 Mathematical models will be operated on specific computational platforms and will allow predicting the behaviour of several industrial processes @M12 Archaeological model will be used to relate macroscopic properties to formulations (i.e. gelators content, oil/water ratio) and operating conditions @M18 System for continuous monitoring of the industrial system @M36
	TRL5@M12; TRL6@M24; TRL7@M36
Smart food industry: virtualization, sensing, IoT of advanced traceability (Coordinator Giuseppe Araniti Unirc)	 on-line monitoring sensors of the production process @M15 develop Agritech Smart factory platform quickly reconfigurable and adaptable to the various transformations or differentiations of the production processes @M36 fingerprinting (genetic, chemical, microbiological, environmental food markers for food quality) for database implementation @TRL12, TRL 24 system for monitoring the quality and conservation of food products @M36 fleet management solutions (algorithms and heuristics and real-time GPS position) to identify the position of vehicles @M12 for delivery with sensor @M24 to guarantee chain traceability @M36 blockchain platform integrated into project ICT solutions to support authenticity, traceability, waste monitoring, and transparency of products

G3.5 Green Chemistry for Circular Economy

Goal Leader: Francesco Mauriello (Unirc) - Associate Professor of Chemical Fundamentals of Technologies Activity Plan: Agri-food and forest chains generate side-streams that need to be valorized reducing their negative impact on the environment. The research will be implemented to: a) validate cascade approaches where bioactive compounds can be extracted before their conversion into organic fertilizers, biostimulants and/or renewable energy (biogas); b) valorize processes including insect bioconversion; c) improve crop performance and stress resistance.

Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation		
Integrated system for the total enhancement of agro- industrial waste and residues (Coordinator: Francesco Mauriello, Unirc)	 Valorization of agro-industrial waste into bioactive ingredients (BI), value-added compounds (AC), biogas (BG) and biofertilizers (BF). The entire process and related technologies will be validated in the relevant environment TRL 6, @M36 Scalable HC reactors at industrial scale TRL7, @M36 Agri-food by-products bioconversion mediated by H. illucens will allow obtaining wholemeal flour rich in proteins, lipids and chitin (CH) optimizing extraction protocols, for use in feed and food. These objectives will be pursued by the realization of a semi-industrial pilot breeding of <i>H. illucens, TRL6 @M36</i> 		

Spoke 4 - Safeguarding and promoting natural and cultural heritage to mitigate climate change					
impact and strengthen local identity					
Leader: UnibasPartners: Unical, Unirc, CNRBudget€ 19.989.901					
Coordinator: Ferdinando Felice Mirizzi (Unibas), Full Prof. of Dermoenthoantropological Disciplines					



Mission of the Spoke Research activities under this cluster will be addressed to mitigate climate change impact on particularly exposed built cultural assets, such as the ones located in marine/coastal areas and the ones located in flood risk zones, and to improve the sustainability and the accessibility of natural and cultural (both tangible and intangible) heritage in Calabria and Basilicata. In line with the specific goals of the Tech4you program "adaptation of cultural heritage" (SO4), it will contribute to reaching multiple SDGs with the most direct impact on SDG 4 (Quality education), SDG 8 (Decent work and economic growth), SDG 10 (Reduce inequalities), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action), SDG 12 (Responsible production and consumption). 14 pilot projects, fitting with the scientific expertise of involved research groups, will be implemented to pursue the following goals: a) strengthen the territorial identities to bring out and enhance the urban and rural peculiarities in Calabria and Basilicata; b) enhance the identity built Heritage with a view on open design, innovative management and smart tourism; c) manage natural heritage (NH) to improve urban quality and well-being of citizens; d) mitigate climate change impact on the marinecoastal heritage; e) make the cultural heritage (CH) and NH accessible for all enabling a sustainable and responsible experiential tourism; f) improve the central role of ecosystem services in arranging actions for combating climate change; g) manage information and enable interventions for the structural and environmental safety of built CH.

Target group: Citizens as both consumers and stakeholders, cultural and creative professionals, municipalities, regional government, public bodies and micro enterprises

G4.1 Preservation and enhancement of cultural heritage (tangible and intangible sources) and local identities in Calabria and Basilicata

Goal coordinator: Fulvio Delle Donne (Unibas), Associate Prof. of Medieval and humanistic Latin literature Activity Plan: a) IT tools for digital preservation and dissemination of tangible and intangible CH; b) tools for territorial identities to promote environmentally sustainable, experiential cultural routes; c) integrated approaches and systems to enhance tangible and intangible CH and to improve the sustainability and accessibility of internal areas.

Pilot Projects		Ou	Outputs, Milestones and indicators for the ex-post evaluation	
1.	Safeguarding and digital preservation of the written sources related to the processes of construction of local identities in the Calabrian and Lucanian areas (Coordinator Fulvio Delle Donne, Unibas)	• •	Collecting, analyzing and encoding different written sources (historical, literary, linguistic, exhibited, etc.): >60 items@M12, >130 items@M24 >200 items@M36 Testing a platform prototype in a live/virtual experiment TRL6@M18 and TRL7@M36 and populated with >10 routes	
2.	Creating sustainable and experiential cultural routes for the construction of local identities (Coordinator Elisa Acanfora, Unibas)	•	Digital classification of oral, dialectal, sonic and visual sources completed @M12; Validation of at least 4 digital products for dissemination at TRL5 @M18 and TRL7 @M36	
3.	Documentation, diagnostics, conservation and enhancement of the archaeological heritage and its material sources in Basilicata and Calabria (Coordinator Maria Chiara Monaco, Unibas)	•	Qualifying diagnostic protocols for non-destructive analyses of archaeological materials on 5 sites; Bio-cleaning and chitosan and renovation protocol of archaeological materials validated at TRL5 @M24; bio-formulates from microorganisms/plants TRL7 @M36; a platform for archiving documentation to enable data exchange with PA validated at TRL5 @M24 and TRL6 @M36	

G4.2 Cultural Heritage and Place Identity: Open Design, Innovative Management and Smart Tourism

Goal coordinator: Antonella Guida (Unibas), Full prof. Technical Architecture

Activity Plan: a) Creation of a twin-digital model and materials passport of built Heritage for innovative and integrated management of Life Cycle Design (LCD) to simulate the physical and environmental variations, in connection with metadata updated; b) application of a set of innovative methodologies, models and digital tools to strengthen local identity in terms of the pervasiveness of digital transformation in businesses,





sustainable/inclusive/smart tourism offer, improving local economies based on cultural heritage exploitation and networking among operators.

Pilot Projects	Outputs, Milestones and indicators for the ex-post evaluation		
 Open Knowledge and innovative digital tools for a resilient Cultural Heritage (Coordinator Antonella Guida, Unibas) 	 Digital tool for the assignment of heritage materials passport with Blockchain developed at TRL7@M18 and TRL9 @M36 in 4 pilot cases Eco-friendly/sustainable protective coating and consolidant products at TRL7@M24 and TRL9 @M36 with n.1 patent of nanoparticles product Self-sensing nano-composite sensors for structural monitoring developed at TRL7 @M24 and TRL9@M36 with n. 1 patent Development of chaotic and bio-inspired design algorithms to create artistic >20 artefacts, demonstrated at TRL7@M18 and TRL9 @M36 		
 SDI for Tourism ecosystems innovation and development based on cultural heritage (Coordinator Daniela Carlucci, Unibas) 	 Spatial Data Infrastructure (SDI) for the assessment of the tourism ecosystems developed at TRL6@M18 and TRL8@M36 Development and demonstration of sustainable cultural tourism approaches and models in >2 @M18 and >5 @M36 pilot areas Digital transformation assessment in 2 @M18 and 5 @M36 pilot areas 		

G4.3 Management and enhancement of high-value natural heritage and environmental and cultural landscape of urban and extra-urban areas

Goal coordinator: Mariavaleria Mininni (Unibas), Full Prof. Urban Planning

Activity Plan: Evaluate and indicate the regeneration potential of the urban peri-urban and extra-urban environment context, starting from the natural heritage understood as the set of the spatial, social, cultural and infrastructural components that make up the dimension of nature in the city and the territory.

Pilot Projects	Outputs, Milestones and indicators for the ex-post evaluation		
1. "Green Shapes" for the Urban Regeneration	• Development of Urban regeneration systems "green shapes" in pilot sites: 2@M12, 4@M24, 6@M36		
Processes, Environmental, Social, Cultural and Tourism Sustainability	• Implement a database of: a) suitable plant species: 50@M18, 100@M36; b) green areas in the cities: 50@M18, 100@M36; c) other data as stakeholders and productions: 300@M18, 800@M36		
(Coordinator Ettore Vadini, Unibas)	• Integrated IT-storytelling system for cultural landscape (include the definition a network of slow use of territories): 60@M18,120@M36		
2. Parks, forests, landforms, rural landscapes, and multifunctional agriculture (Coordinator Marcello Schiattarella, Unibas)	 Spatial data taxonomy analysis (structure, function paths, corridors, matrix) of forests, parks and agroforestry surfaces, morpho-sedimentary markers of climate change and environmental hazard in rural Calabria and Basilicata landscapes: >100@M18 and >200@M30 Coherent scientific literature indicators for monitoring climate change phenomena validated at TRL7 @M24 and TRL8 @M36 Experimental models and management and planning guidelines examples >5 @M24 to >10 @M36 		

G4.4 Monitoring and I	mitigation of the climate change impact on Cultural Heritage				
Goal coordinator: Mauro Francesco La Russa (Unical), Mineral resources and Mineralogical-Petrographical					
Applications for the Environmer	Applications for the Environment and cultural heritage				
Activity Plan: a) Assessment and demonstration in a relevant environment of innovative materials, techniques					
and tools on >3 pilot sites; b) interval	egrated system for monitoring and reducing the degradation of underwater CH.				
Pilot Projects	Outputs, Milestones and indicators for the ex-post evaluation				
1. Innovative materials and tools to mitigate the climate change impact on the cultural heritage in the marine and coastal areas (Coordinator M. F. La Russa, Unical)	 Bring the following technologies up to TRL7 @M18 and TRL8 @M36: 1- 3 consolidant and green products for the protection of artefacts in marine-coastal areas; 1 smart device for the application of the products; hybrid robot system for monitoring in harsh environments n.2 systems for the characterization of materials and monitoring/prediction/mitigation of degradation phenomena 				





2.	Monitoring the degradation	• Underwater drone with advanced optoacoustic sensing capabilities for	
	of underwater CH		documenting and monitoring underwater CH
	Coordinator Maurizio •		Sensor network for monitoring and surveilling underwater CH
	Muzzupappa, Unical)	•	Mechatronic tools for underwater cleaning and sampling

G4.5Sustainability and Accessibility of Cultural and Natural HeritageGoal coordinator: Fabio Bruno (Unical), Associate Prof. Design and methods of industrial engineeringActivity Plan: a) eXtended Reality (XR) tools to speed up and improve the dissemination of cultural/natural
heritage; b) devices to improve sensorial accessibility to disabled people; c) tools to make accessible the
intangible, and often invisible, CH in the Calabrian and Lucanian area.

Pilo	ot Projects	Ou	tputs, Milestones and indicators for the ex-post evaluation
1.	Enabling accessibility and sustainability in minor destinations (Coordinator Fabio Bruno, Unical)	•	eXtended Reality toolkit for rapid development of applications based on gamification validated at TRL5 @M18, at TRL7 @M24, demonstrated on >3 minor destinations by involving >6 local professionals @M36 Immersive Virtual Exhibitions with AI-based customized and interactive digital storytelling validated at TRL6 @M18 and TRL8 @M36
2.	Improving accessibility to Cultural and Natural Heritage (Coordinator Francesco Altimari, Unical)	•	 Bring the following technologies and systems up to TRL5 @M12 and TRL7 @M30 and tested with >20 users @M36 with satisfaction rate >5/7: 1- Multi-sensory system to allow blind or deaf people to access artworks Underwater audio guide to enable visually impaired people to access the submerged N&CH Online digital platform to enable the accessibility of the CH of the Albanian communities (>10) of the Calabrian-Lucanian area
3.	On-site dissemination of the monumental heritage of the Calabrian Coast (Coordinator Francesca Fatta, Unirc)	•	Digital platform documenting towers and coastal places described in the Codice Romano-Carratelli (XVI century) as nodes of a slow tourist network developed at TRL7 @M18 and populated with > 60 digital models @M36 2- Mobile app for accessing the platform with the possibility of triggering geo-localized XR interactions validated at TRL6 @M12 and TRL8 @M24

G4.6 Planning for Climate Change to boost cultural and natural heritage: demand-oriented ecosystem services based on enabling ICT and AI technologies

Goal coordinator: Prof. Francesca Moraci (Unirc), Full Prof. Urban Planning

Activity Plan: a) ecosystem services to improve the supply of goods and services for the well-being of society by incorporating the ability to adapt to both current risks and future climate change, reducing the ecological footprint and ecological debts, while improving resilience, health and quality of life; b) frame planning models based on Big Data and AI to handle the complex systems involved in climate-proofing towards a user-tailored perspective reinforced by Earth Observation (EO).

Pilot Projects	Outputs, Milestones and indicators for the ex-post evaluation
 Climate adaptation plans for the reduction of the ecological footprint and ecological debt, aimed at improving the conservation and transformation response in terms of resilience and quality of life in the Calabrian and Lucanian urban and territorial systems (Coordinator Francesca Moraci Unirc) 	 Building a Data Catalog for the systematization of Ecosystem Services at TRL6 @12M on 2 selected areas Digital interface development to connect AI models with remote sensing data at TRL7 @18M No. 3 optimal territorial areas extraction according to the variety of ecosystem services to perform the platform at TRL7 @24M Data certification technology based on Ecosystem services and optimal territorial areas at TRL7 @26M 5. Action Plan on Climate Change Adaptation and Resilience development based on technology demonstrator at TRL7 @36M





G4.7 Protection and enhancement of natural and cultural heritage and identity of the inner territories

Goal coordinator: Adolfo Santini (Unirc), Full Prof. of Building Science Activity Plan: a) address the physical and digital management of the "data-information-resources" system, towards the production of models, methods, prototypes realized in "dynamic" regimes, such as "uncertain parameters" and "limit states" of the analysis and "predictive models of advanced design" for the adaptability to climate scenarios; b) demonstration in the relevant environment on n.2 case studies in n.2 historical identity settlements in the most fragile inland areas of Calabria (depopulation).

Pilot Projects	Outputs, Milestones and indicators for the ex-post evaluation
	• Bring the following technologies up to TRL6 @M18 and TRL7 @M36:
	• DB of structural typologies for the historical buildings in the selected inland settlement of Calabria (nr.1 DB with nr. 2 modules for 3 scenarios)
1. Open platform "phigital	• A numerical method for the prediction of mechanisms and collapse load of historical buildings falling in fragile territories (2 cases to 3 scenarios)
space" (physical and	• Solutions for ground improvements in fragile areas (no. 3 scenarios)
digital) of the type "user profiling" for the advanced and dynamic	• Time-varying vulnerability assessment tools and advanced protocols for cataloguing existing historic buildings on identity structural types; (no 2 protocols for 3 scenarios)
co-design of interventions on the built	• Digital active control device, based on the concept of inerter, for the protection and security of monumental heritage; (nr. 3 scenarios)
and ex-novo (Coordinator Consuelo Nava, Unirc)	• Structural components in locally resonant metamaterials for structural and environmental safety of historic buildings; (no.2 series x 3 scenarios)
	• Atlas of predictive models and adaptive technologies on climate scenarios for historical heritage buildings (no 3 scenarios for 2 cases)
	• Enabling Technologies and Additive Manufacturing (3D printing) of prototypes of systems and components on testing cases (no. 8 prototypes)

Spoke 5 - Technologies for healthy nutrition and resilient communities			
Leader: Unicz	Partners: Unical, Biotecnomed, Epitech group	Budget	€ 19.550.000
Coordinator: Giovanni Cuda (Unicz), Full Professor of Molecular Biology			

Mission of the Spoke: research activities under this cluster will increase community resilience reducing emotional distress and increasing more sustainable lifestyles. Climate change affects our psycho-physical wellbeing ("solastalgia") and health, in line with the specific goals of the Tech4you program " resilient and healthy communities" (SO5), it will contribute to reaching multiple SDGs with the most direct impact on SDG3 (Good health and well-being), SGS10 (Reduce inequalities), and SDG 12 (Responsible production and consumption). The Spoke aims to test in real environment innovative models of "wellness farms" as eco-sustainable places to achieve a climate-friendly daily life (functional foods, dermo-cosmetic treatments, fitness itineraries, rehabilitation and wearable devices to monitor the state of well-being). The scheduling tasks have been proposed by Spoke's coordinator and perfectly fit with the scientific expertise of involved research groups to a) test a functional food (method patent registered) for the treatment of osteoporosis through the use of eco-sustainable technologies and agronomic methods (lycopene-rich tomato sauce); b) improve the resilience of human skin to climate impact reducing main skin disorder; c) increase the information on personal health status using the wearable digital device; d) to increase scientific knowledge of nutraceuticals and dermo-cosmetics effect using a multi-omic panel.

Target group: Citizens as consumers will be involved in all stages of the implementation so that they can be co-creator of the same community; Cosmetic and nutraceutical companies, wellness companies; healthcare systems.

G5.1 Clinical-experimental validation of innovative nutraceutical products for a healthy diet with therapeutic value

Goal Leader: Arturo Pujia (Unicz), Full Prof. of Applied Dietetic Sciences

Activity Plan: An adequate nutritional status is essential for healthy ageing, and functional foods can help for maintaining good bone health. The activities aim to develop and test a functional food, starting from an already



patented prototype (nr: 1020190000006 del 03/01/2019), for the treatment of human diseases through the use of eco-sustainable technologies and agronomic methods. In particular, lycopene-rich tomato sauce, obtained from a traditional agronomic technique called "ripening" will be tested to prevent osteoporosis and to reduce related complications in postmenopausal women.

	Pilot Projects		Outputs, milestones and indicators for the ex-post evaluation
1.	FUTOS "FUnctional lycopene-rich Tomato sauce	•	Protocols for the production of functional Calabrian tomato sauce: @ M12
	for OSteoporosis prevention in postmenopausal women" (Coordinator Tiziana Montalcini, Unicz)	•	In vitro studies to evaluate the effects of the bioactive components of functional Calabrian tomato puree in an osteoporosis model: @M 18 Study of human-product bioavailability: @M24 A clinical trial of functional Calabrian tomato sauce on humans @M24; Evaluation of the results of the clinical study @M36 Expected TRL to be achieved: 8

Goal Leader: Donatella Paolino (Unicz), Full Prof. of Applied Medical NanoTechnologies

Activity Plan: This research activity aims to demonstrate a functionalized dermo-cosmetic line able to improve the state of psycho-physical well-being using raw materials obtained from local resources, especially derived from agrifood waste production formulated with the most innovative technologies using green chemistry techniques to minimize the environmental impact. Raw materials will be combined with the most innovative cosmetic technologies. The final scope is to test in a real environment complete and highly functionalized dermo-cosmetic lines to reduce the impact of climate change on the skin.

Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation
 Nanosized topical delivery systems Dermo (Coordinator Donatella Paolino, Unicz) 	 Key technologies in vitro tested @M12 In vivo tested completed @M24; System complete and qualified (industrial scale-up) @M36 Validation of the natural raw materials @M6; Key technologies in vitro tested and efficacy evaluation @M18; In vivo evaluation on healthy volunteers @M24; Scale-up and industrial production @M36 Expected TRL to be achieved: 8

Study, design and validation of a wearable digital device for the management of activities within the Wellness Farm

Goal Leader: Aldo Quattrone (Unicz), Professor Emeritus of Neurology

G5.3

Activity Plan: Test a new wearable IoT device capable of: a) guiding a person through experiential paths within the Wellness Factor: trekking in nature, tourist-cultural itineraries, tastings of nutraceutical products, relaxation in wellness & spa environments with the use of cosmetic products, etc.; b) provide real-time information on the experience enjoyed: characteristics of the paths, nutraceutical properties of foods, information on the cosmeceuticals used; c) acquire measurements of pulse rate, heart rate variability (HRV), skin galvanic response and photoplethysmographic estimate of blood pressure, to evaluate and quantify the state of well-being of the subject during the fruition of the experiences; d) collect and process feedback from the subject on the level of satisfaction of the experiences enjoyed.

Outputs	Milestones and indicators for the ex-post evaluation
 Wearable Digital Devices for Wellness Monitoring (Coordinator: Aldo Quattrone – UNICZ) 	 Key technologies prototype (assessment of relaxation and stress and for the evaluation of the levels of satisfaction)@M12 Pilot prototype (electronic hardware, wearable bracelet, firmware, mobile app and software platform)@M24 demonstrator covers at least 50 end-users @M30 The pilot demonstrated at relevant environment TRL7 @M36





G5.4 Generation and clinical-experimental validation of multi-omic panels for validating the efficacy of nutraceuticals and dermo-cosmetics

Goal Leader: Giovanni Cuda (Unicz), Full Professor of Molecular Biology

Activity Plan: test and demonstration of new omics panels for the evaluation of the efficacy of nutraceuticals and dermo-cosmetics on human health and well-being. The technologies available at the technological platforms of genomics, proteomics and metabolomics present in the laboratories of the Magna Graecia University of Catanzaro will be used by the researchers belonging to these platforms for: a) development and validation of omics panels capable of defining with great accuracy and sensitivity changes in plasma levels of proteins and metabolites following the intake of nutraceuticals or treatment with dermo-cosmetics; b) tested using bioactive compounds derived from plants, milk or derivatives, will be evaluated under the transcriptomic, proteomic and metabolomic profile, to identify molecular markers that allow a quantitative definition of the effects of these active substances on human health.

	Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation
1.	Innovative omics panels to validate the efficacy of nutraceutics and dermo- cosmetics on health within the "Wellness Farms" (Coordinator Giovanni Cuda, Unicz)	 Validation of a genomic/transcriptomic panel of molecular biomarkers for monitoring the effects of nutraceutics and dermo-cosmetics on health and wellness @M12 Validation of a proteomics panel of molecular biomarkers for monitoring the effects of nutraceutics and dermo-cosmetics on health and wellness @M24 Validation of metabolomic panel of molecular biomarkers for monitoring the effects of nutraceutics and dermo-cosmetics on health and wellness @M24 Validation of metabolomic panel of molecular biomarkers for monitoring the effects of nutraceutics and dermo-cosmetics on health and wellness @ M36. Pilot validate @M36

Spoke 6 - Digital transformation and Technology Transfer			
Leader: Unical	Affiliates: Unibas, Unicz, Unirc, ENM, Engineering,	Budget	€ 19.950.000
	NTT Data Italia SpA, Entopan Innovation SRL		
Coordinator: Gianluigi Greco (Unical), Full Prof. of Computer Science			

Mission of the Spoke the spoke will act as a development flywheel for the digital innovation of the productive fabric of the ecosystem, bridging the gap in knowledge and skills between the Academic system - widely recognized as a reference point for the ICT sector in Italy - and the local companies, especially SMEs, which suffer from significant delays in the adoption of platforms and solutions based on key enabling technologies. To this end, the spoke will support entrepreneurship based on technological innovation related to the digital domain, in a multisectoral perspective that will pay particular attention to the needs emerging from the thematic spokes of the ecosystem. In addition, the spoke will provide local businesses and SMEs with incubation and acceleration services, open innovation programmes and advanced R&D services, by encouraging high-innovative projects with disruptive potential as well as by focusing on several specific pilots with high TRL that can be of interest to the citizenship as a whole.

G6.1 Digital solutions matching the needs of thematic spokes

Goal Leader: Sergio Greco (Unical), Full Prof. of Information processing systems

Activity Plan: the main objective is to define specific R&D actions focused on the application areas defined by the thematic spokes of the ecosystem. Interacting with the actors who have specific skills in the sectors of interest, the spoke will analyse the requirements and the demand for innovation, through specific actions aimed at involving stakeholders based on workshops, seminars, and hackathons, to name a few examples. Appropriate technological solutions will therefore be identified that will enable a concrete and effective digital transition in these production sectors, framing them within an architectural reference platform that will allow easy prototyping of the various solutions, sharing the main needs that will emerge at the digital level. The Activity plan is based on the following steps: a)Requirement analysis; b) Stakeholder Engagement to identify the demand for innovation; c) Identification of key technologies to enable the solutions and definition of a methodological approach and an architectural framework to implement digital platforms in the ecosystem; d) Release of the enabling platform and applications in the sectors of the spokes.



Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation
A platform for easy	Requirement analysis @M8; 20 stockholders engaged @M12; 40
prototyping vertical solutions.	stockholders engaged @M24; 160 stockholders engaged @M36;
Coordinator Sergio Greco,	Framework released @M24; 3 deployed applications @M36; Pilot
Unical	validated at TRL7@M36

C6 2	Marketplace of enabling digital solutions stimulating novel paradigms in the thematic
G0.2	spokes

Goal Leader: Giuseppe Araniti (Unirc), Associate Professor in Telecomunications

Activity Plan: the objective is to define a basket of technical solutions to support the digital transformation in the ecosystem. The basket will be used by the companies to develop innovative services and products that may enable new business models and enhance market opportunities. It will therefore be relevant to define and implement an innovation showcase that allows SMEs to overcome the difficulties they encounter in recognizing the technologies that can most help the development of their innovation. It will also be relevant to support and facilitate the adoption of these technologies to close the gap between academic research and business. Specifically, we will work on the following enabling technologies/solutions that will be designed and implemented for the benefit of the innovation ecosystem in the field of: (i) Artificial Intelligence – from both a symbolic and a DL/ML point of view, to pursue a perceptive, cognitive, autonomous and goal-oriented approach, (ii) Cybersecurity, to provide the entire action of the ecosystem with security-by-design capabilities and to support the resilience of the implemented solutions, (iii) Internet of Things – IoT networking solution for the interconnection of heterogeneous and resource-constrained objects by exploiting virtualization and softwarization paradigms, (iv) networking and devices for smart communication and sensing with advanced features in terms of reliability and efficiency; (v) Bioinformatics, health informatics and new technologies to improve lifestyle and well-being of citizens.

Following the activities: a) Design and implementation of the backend platform for IoT and User Experience services;b)Design and implementation of AI solutions; c)Design and implementation of Security solutions; d)Design and implementation of IoT solutions; e)Design and implementation of networks and devices for smart communication and sensing; f)Facilitating the adoption of the digital solutions in SMEs; g)Development of start-up acceleration and TT strategies; h)Tutoring programs, living labs; i) Design and implementation of AI solutions for the healthy lifestyle and well-being of citizens.

Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation
Marketplace of digital	Availability of the back-end platform @M12; 2 spokes benefiting of the
solutions.	enabling solutions @M24; 5 start-ups involved @M24; 5 spokes benefiting
Coordinator Giuseppe	of the enabling solutions @M36; 10 start-ups involved @M36; Pilot
Araniti, Unirc	validated at TRL7@M36

G6.3 Quality Assurance of Digital Solutions

Goal Leader: Domenico Daniele Bloisi (Unibas), Associate Professor of Information processing systems

Activity Plan: The objective is to provide services aimed at assuring the quality of the digital solutions provided by the ecosystem as well as at supporting the SMEs located in the territorial area of the ecosystem to assess their readiness to digital transformation and the quality of their solutions. The pilots and platforms delivered in the ecosystem will undergo a systematic study for checking their compliance, their security, and possible data privacy issues. Efforts will be devoted to integrating the applications developed in G6.1 e G6.2, by providing coherent and transparent access to the various facilities according to a microservice-based architecture. After an initial user needs survey, the services developed in G6.1 and G6.2 will be evaluated also with final users to explore and analyse the target audience's behaviour when interacting with them. The G6.3 involves the following activities: a) User needs survey; b) Services to assess the digital maturity;c) Integration and testing and the platforms and prototypes: d) Compliance, security and zdata privacy checks; e) User and market testing.

Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation						
Compliance, security and	50 surveys collected @M12; User marked testing released @M24;						
data privacy checks.	Integrated platform @M24; Pilot validated at TRL7@M36						





Coordinator Domenico Daniele Bloisi, Unibas

G6.4 Digital Pilots for Public Policies

Goal Leader: Giorgio Scarpelli (NTT), Senior Vice President

Activity Plan: develop specific pilots tailored to support the needs of the Public Administration, and in particular of the Region Calabria, in addressing some challenges that have a broad impact on the life of the citizens. The Pilot must have a high level of maturity and should deploy solutions that provide added value to the society, by dealing with objectives promoting sustainable growth. Particular attention will be devoted to defining pilots in the area of Environment, Protection and Promotion and Computational epidemiology and surveillance. This ambitious goal will be achieved thanks to a careful assessment of the specific risk factors of the Calabrian territory, considering its main characteristics. To this end, the availability of distributed monitoring infrastructures is mandatory, on which cutting-edge data fusion and data intelligence techniques will be applied to provide stakeholders with the appropriate tools to make effective operational decisions in the event of crisis but also to plan methods of more effective contrast in the long run. This information base will also represent a precious foundation for defining territorial promotion and growth strategies consistent with their specific vocation.

Following the activities: a) Modelling of Environmental Risks, which includes risks categorization, identification of risks factors, the definition of risk assessment and risk management technologies and processes; b) Pilot on risk assessment and management for the environment in a specific domain (e.g. forest fires); c) Needs analysis; d) Scouting innovative solutions; e) PCP and Living Lab; f) Computational modelling of epidemiology and surveillance for global and local emergencies.

Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation							
Platforms for public policies.	Methodological framework @M12; 5 innovative solutions identified							
Coordinator Giorgio	@M24; 10 innovative solutions identified @M36; Pilot validated at							
Scarpelli, NTT Data	TRL7@M36							

G6.5 Digital Pilots for Public Policies

Goal Leader: Maurizio Muzzupappa, Rector Delegate for Technology Transfer

Activity Plan: a) to enhance the research results of Tech4You program through the use of the SPP-C model (Scouting, Protection, Partnership & Companies) ideated and used by the Technology Transfer Office (TTO) of the University of Calabria (UNICAL); b) to increase the collaboration with the other TTOs of partners involved; c) to implement the "Exploitation, Dissemination and Communication" to increase the number of Intellectual Property. Tasks:(i) Scouting of research results and TRL monitoring; (ii) market analysis; (iii) prior art searches (freedom to operate and/or patentability);(iv) use model and main competitors; (v) Protection (patent, copyright, etc.) methods and procedures; (vi) Partnerships (specific tools for negotiation phases (confidentiality agreements (NDA), material transfer agreements (MTA), etc.); (vii) Spin-off creation (transformation of intangibles-assets into business entities), accompanying the enterprises in developing impact pathway; (viii) training for researchers and PhD students (Program Phd3.0).

The SPP-C model focuses on technology transfer actions (incubation, training on intellectual property rights, entrepreneurship, business modelling, training of PhD students and researchers on the exploitation of research results). The use of the SPP-C model will improve the competitiveness of SMEs, strengthen human capital, and reduce the mismatch between university skills and the unmet needs of SMEs. The exploitation of research results will be constantly monitored to verify the actual impact (economic, social, etc.) on the territory of the actions undertaken through specific indicators (see section D).

Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation				
SPP-C model implementation.	3 Business Plan Competition@M12,@M24,@M36; 25 start-ups				
Coordinator Maurizio Muzzupappa,	@M36; 100 PhD students involved in PhD3.0 training course @M12,				
Unical	@M24, @M36; 70 Innovation Technology Training@M36				



G6.6 Incubation and Acceleration Programmes

Leader: Gennaro Di Cello (EI), Vice President

Activity Plan: The activities support the "ideas and companies of the future", combining technological innovation with social innovation, in line with the objectives of the UN Agenda 2030, of the Green New Deal and Next Generation programs of the European Commission. The main activities will be to support the development of the business model, refining the value proposition to align it with the state-of-the-art technological advancement, while also enabling Open Innovation processes, favouring the intersection between supply and demand for innovation. In particular, it will provide specific and transversal services of incubation to support the creation of spin-offs and innovative start-ups, acceleration of innovative enterprises and open innovation programmes. The actions involve the stakeholders participating in workshops, hackathons, boot camps, matchmaking events, investor day and other specific events. The activity will support the target in finding investments for their development, encouraging venture building, promoting entrepreneurial microcredit, and fostering networking between the target and investors. Also, it will provide an in-depth support service for the target to enable the participants to high-level international R&D initiatives, funded by European and National research and acceleration programs (e.g., Horizon Europe, European Innovation Council). Task: a) Incubation; b) Acceleration; c) Venture Building; d) Funding and Investments; e) Open Innovation; f)

Task: a) Incubation; b) Acceleration; c) Venture Building; d) Funding and Investments; e) Open Innovation; f) Networking.

Pilot Projects	Outputs, milestones and indicators for the ex-post evaluation					
Services for incubation and	1 incubation program @M12; 30 supported start-ups @M24; 2					
acceleration (Coordinator	acceleration programs @M24; 40 supported SMEs @M24M; 4 open					
Gennaro Di Cello, Entopan	innovation programs with 60 start-up and corporates supported @M36					
Innovation)						

The activities foreseen by the work plan will be carried out during the 36 months of the project under the supervision, at a first level, by the various spokes, then, at a higher level, by the hub, which has provided specific actions to control and monitor the progress of the project, according to the milestones that have been indicated above.

Budget

The following table provides a detail of the costs, for each spoke and each partner, divided by type of activity and with the indication of their territorial distribution. It should be noted that the expenses related to the involvement of civil society on issues related to innovation, economic and social sustainability, technical skills and scientific culture (public engagement), are nil here, as they have been centralised at the hub level.





	Partner Re		Activities									
Spoke		Region	Industrial Research		experimental development		Industrial PhD		Start up & Spin off		Total	Staff
			total	staff	total	staff	total	staff	total	staff	1	
	CNR	Calabria	3.378.565€	1.351.426€	2.459.995€	1.770.681€	120.000 €	120.000 €	184.285 €	92.143€	6.142.845€	3.334.250 €
	Unical	Basilicata	4.120.092€	1.648.037€	1.885.252€	1.769.972€	1.261.000€	1.261.000€	224.732 €	112.366€	7.491.077€	4.791.375€
1 - CNR	UNIBAS	Calabria	1.975.643€	790.257 €	1.416.673€	720.737 €	92.000 €	92.000 €	107.762 €	53.881€	3.592.078 €	1.656.875 €
	UNIRC	Calabria	2.519.976€	1.007.990€	1.786.345€	546.158 €	138.000 €	138.000 €	137.453 €	68.727€	4.581.775€	1.760.875€
	Tot	tale	11.994.276 €	4.797.711€	7.548.266 €	4.807.548 €	1.611.000 €	1.611.000 €	654.233 €	327.117€	21.807.775 €	11.543.375 €
		1										
Spoke	Partner	Region	Industrial	Research	experimental	development	Industr	ial PhD	Start up a	s Spin off	Total	Staff
		a lub i	total	staff	total	staff	total	staff	total	staff	17.011.000.0	6 201 275 6
	Unical	Calabria	10.345.145 €	3.620.801€	5.8/9.344 €	1.652.365€	845.000 €	845.000 €	1/2.419€	86.210€	17.241.908€	6.204.375€
	Unibas	Basilicata	1.805.395 €	631.888 €	1.043.506 €	488.56/ €	130.000 €	130.000€	30.090 €	15.045 €	3.008.991 €	1.265.500€
	Unirc	Calabria	1.221.808€	427.633€	/94.1/5€	1.749.936 €	- E	- E	20.363 €	10.182 €	2.036.346 €	2.187.750€
	LORA	Calabria	2.108.280 €	/3/.898€	1.045.382 €	565.783 €	325.000€	325.000€	35.138 €	17.569 €	3.513.800€	1.746.250€
2 - Unical	ISPKA	Calabria	180.000 €	63.000 €	120.000€	109.875€	• €	• €	- 6	• •	300.000€	1/2.8/5€
	ARPACAL	Calabria	180.000€	63.000 €	120.000€	129.375€	- E	- €	- €	- 6	300.000€	192.375€
	RINA	Calabria	480.000€	240.000€	320.000€	295.000 €	· €	- €	- €	- €	800.000€	535.000€
-	TECHFEM	Calabria	540.000 €	270.000€	360.000€	270.000 €	- €	- €	- E	3 - E	900.000€	540.000€
	Ell Manuf.	Lazio	- t	- t	- t	- t	· t	- t	500.000 €	268.576 €	500.000 €	268.576 €
	10	tale	10.860.627€	6.054.219€	9.682.408 €	5.360.900 €	1.300.000€	1.300.000€	758.010€	397.581€	28.601.045 €	13.112./01€
			Industria	Research	experimental	development	Industr	ial PhD	Start un 2	& Snin off		
Spoke	Partner	Region	total	staff	total	staff	total	staff	total	staff	Total	Staff
-	LINIRC	CALABRIA	9 222 172 €	3 227 760 €	4 230 816 €	1 622 490 €	520.000 €	520.000 C	. (. (13 972 988 €	5 370 250 f
	UNICAL	CALABRIA	1.986.914 €	695 420 £	958.562 £	971 879 £	65.000 €	65.000 £	- €	- £	3.010.476€	1 732 299 €
	LINIBAS	BASILICATA	1.602.290 €	560.802 €	695 422 €	531 573 €	130 000 €	130,000 €	. 6	. 6	2 427 713 €	1.732.235€
3-UNIRC	CNR	CALABRIA	613 173 €	214 611 €	315 877 €	298 764 €	- f	- •	- 6	- 6	929.050 €	513 375 €
5 chine	CREA	CALABRIA	430 954 £	150 834 £	222 007 £	313 041 €		. 6	. 6	. f	652 961 £	463.875 €
	TIM	LAZIO	450.554 C	332 248 €	352 384 €	174 564 €	- f	- f	- f	- f	1 006 813€	506 813 €
	To	tale	14.520.000 €	5.181.674€	6.775.068 €	3.912.312 €	715.000 €	715.000 €	· €	- C	22.000.000 €	9,808,986 €
									-			
Casha	Destaur	Benien	Industrial Research		experimental development		Industrial PhD		Start up & Spin off		Tetal	Chall.
эроке	Partner Region	total	staff	total	staff	total	staff	total	staff	Total	Starr	
	UNIBAS	Basilicata	4.923.000 €	2.461.500 €	4.109.540 €	2.357.915 €	715.000 €	715.000 €	98.460 €	98.460 €	9.846.000 €	5.632.875 €
	UNICAL	Calabria	2.655.000€	1.327.500€	1.496.900€	871.025 €	1.105.000€	1.105.000€	53.100 €	53.100€	5.310.000€	3.356.625€
4 - Unibas	UNIRC	Calabria	2.291.950€	1.145.975€	1.260.479€	531.654 €	985.632 €	985.632 €	45.839 €	45.839 €	4.583.901€	2.709.100€
	CNR	Calabria	125.000 €	62.500 €	122.500 €	101.125 €	- E	- C	2.500 €	2.500 €	250.000 €	166.125 €
	Tot	tale	9.994.950 €	4.997.475 €	6.989.419 €	3.861.719 €	2.805.632 €	2.805.632 €	199.899€	199.899€	19.989.901 €	11.864.725 €
			Industrial Descents		and the second s		In dividual DLD		Chart up 8 Cala aff			
Spoke	Partner	Region	Industrial	Research	experimental	development	Industr	ial PhD	Start up a	s spin off	Total	Staff
	14-1	Uniter Colubria	total	stajj	totai	staff	total	staff	total	stajj	17 500 000 6	7 507 375 6
	Unicz	Calabria	11.025.000€	4.024.875€	5.300.000€	2.650.000€	650.000€	650.000€	525.000€	262.500€	17.500.000€	7.587.375€
F 110107	Onical	Calabria	300.000€	153.500 €	167.500€	83./50€	260.000€	260.000€	22.500 €	11.250€	750.000€	508.500 €
5-UNICZ	Biotecnomea	Calabria	400.000€	282.888 €	400.000€	200.000 €	• €	· t	- 6	• €	800.000 €	482.888 €
	Epitech	VENETO	250.000 €	134.980€	250.000€	125.000 €	715 000 6	- t	- 6	3 0 75 656	500.000 €	259.980 €
	10	tale	11.975.000 €	4.590.245 €	0.117.500 €	5.056.750€	715.000 €	910.000 €	547.500€	2/3./50€	19.550.000 €	0.030.743 E
			Industrial	Industrial Research experimental development		Industrial PhD		Start up & Spin off				
Spoke	Partner	Region	total	staff	total	staff	total	staff	total	staff	Total	Staff
	Unical	Calabria	3,900,000 £	2 116 038 €	2 470 000 €	1 284 400 £	130.000 €	130.000 €	- f	- f	6,500,000,€	3 530 438 £
	UniRC	Calabria	1.200.000 €	626.625 €	800.000 €	400.000 €	· €	- €	- €	- C	2.000.000 €	1.026.625 €
	UniBas	Basilicata	1.200.000 €	632.000 €	800.000 €	400.000 €	- E	- €	- €	- C	2.000.000 €	1.032.000 €
	UniCZ	Calabria	600.000 €	344,250 €	400.000 €	200.000 €	-€	-€	- €	- €	1.000.000€	544.250 €
6 - UNICAL	Engineering	Lazio	1.800.000 €	1.440.000 €	1.200.000 €	960.000 €	· €	- C	- 6	- 6	3.000.000 €	2,400,000 €
	ENM	Lazio	200.000 €	160.000 €	- C	- E	- E	- C	800.000 €	640.000 €	1.000.000 €	800.000 €
	NTT	Calabria	150.000 €	150.000 €	100.000 €	50.000 €	- €	- C	- €	- €	250.000 €	200.000 €
	-									-	1	
	EI	Calabria	840.000 €	516.750 €	- €	-€	- €	- €	3.360.000€	2.184.000 €	4.200.000 €	2.700.750€

The following tables summarize the overall budget of the program, with the indication of its territorial distribution, and the budget allocated for the open calls, divided by spoke.

Total program budget	137.851.720,50 €	
Total budget for spokes	131.898.720,50 €	
Budget for Southern regions	125.891.908,00 € 91%	
Total budget	Cascade Funding to SME	%
21.807.775 €	4.679.500 €	21
28.601.045€	7.144.700 €	25
22.000.000 €	3.212.000 €	15
19.989.901 €	2.637.000€	13
19.550.000 €	1.318.478 €	7
19.950.000 €	2.875.000 €	14
131.898.721 €	21.866.678 €	17
	Fotal program budget Fotal budget for spokes Budget for Southern regions Total budget 21.807.775 € 28.601.045 € 22.000.000 € 19.989.901 € 19.550.000 € 19.950.000 € 131.898.721 €	Fotal program budget $137.851.720,50 \in$ Fotal budget for spokes $131.898.720,50 \in$ Budget for Southern regions $125.891.908,00 \in$ 91% Total budgetCascade Funding to SME $21.807.775 \in$ $4.679.500 \in$ $28.601.045 \in$ $7.144.700 \in$ $22.000.000 \in$ $3.212.000 \in$ $19.989.901 \in$ $2.637.000 \in$ $19.550.000 \in$ $19.950.000 \in$ $2.875.000 \in$ $131.898.721 \in$ $21.866.678 \in$

The following tables, on the other hand, show the significant critical mass put in place by the project partners, detailing the people that each of them has allocated to the project (with the specific request regarding how many of them with at least 3 man-months for each year of the project) and an indication of the total man-months.



	Internal Staff									
SPOKE 1		Year 1		Year 2	Year 3					
	Total	with at least 3 PM	Total	with at least 3 PM	Total with at least 3 PM					
CNR	36	29	36	29	36	29				
Unical	49 4		49	4	49	4				
UNIBAS	24	24 4		4	24	4				
UNIRC	24	8	24	8	24	8				
	Internal Staff									
SPOKE 2		Year 1		Year 2		Year 3				
	Total	with at least 3 PM	Total	with at least 3 PM	Total	with at least 3 PM				
Unical	123	7	123	7	123	7				
Unirc	18	5	18	5	18	5				
Unibas	39	5	39	5	39	5				
CNR	50	4	46	4	30	4				
Arpacal	7	4	7	4	7	4				
Ispra	7	4	7	4	7	4				
Techfem	9	4	4	4	4	4				
RINA	10	4	6	4	6	4				
EIT MAN.	9	4	9	4	9	4				
				Internal Staff						
SPOKE 3		Year 1		Year 2	Year 3					
	Total	with at least 3 PM	Total	with at least 3 PM	Total	with at least 3 PM				
UNIRC	79	18	79	18	79	18				
UNICAL	24 4		24	4	24	4				
UNIBAS	17	4	17 4		17	4				
CNR	9	7	9	7	9	7				
CREA	7	4	7	4	7	4				
TIM	7	7	7	4	7	4				
	Internal Staff									
SPOKE 4		Year 1		Year 2		Year 3				
	Total with at least 3 PM		Total	with at least 3 PM	Total with at least 3 PM					
Unical	57	8	56	8	56	8				
Unirc	36	15	36	14	36	14				
Unibas	77	12	77	12	77	12				
CNR	7	4	7	4	7	4				
	Internal Staff									
SPOKE 5	Year 1 Year 2 Vear 3									
	Total with at least 3 PM		Total	with at least 3 PM	Total with at least 3 PM					
Unicz.	67	67	67	67	67	67				
Unical	10	4	6	4	5	4				
Biotecnomed	7	7	7	7	7	7				
EPITECH	9	4	9	4	9	4				
				Internal Staff						
SPOKE 6	Year 1 Year 2 Year 3									
	Total	with at least 3 PM	Total	with at least 3 PM	Total with at least 3 PM					
Unical	86	6	73	6	64	6				
UniRC	22	4	10	4	4	4				
UniBas	12	4	10	4	4	4				
UniCZ	8	4	7	4	4	4				
Engineering	21	21	21	21	21	21				
ENM	7	7	7	7	7	7				
NTT	7	4	7	4	7	4				
EI	23	23	23	23	23	23				


Roles and responsibilities and expected milestones have been outlined above in the description of each spoke.

C.5) Workgroup

The Tech4You R&I program will involve a critical mass of 10 seconded researchers and provides for 163 new researchers and 113 industrial PhD students.

To achieve the planned activities, the work program is divided into pilot projects and actions. In each ray, the coordinator has identified the best scientific expertise to achieve the main objectives. The critical mass of university departments involved shows the strong commitment of the proposers (more details on roles and competencies in section B).

C.6) Gender issues

In line with 9FP (Horizon Europe), Tech4You Gender Equality (GE) strategy will aim at fostering the representation of women in all its components (R&I teams; project management structures; governance; other decision-making boards; supporting staff; advisory groups; workforce) towards a gender-equal (eco)system. A prerequisite for the effectiveness and sustainability of the GE strategy is the adoption by participants and the Hub of fully-fledged Gender Equality Plans (GEPs) by the end of the first semester of the program implementation that will be continuously enhanced along with the three-yearlong project. These GEPs will also serve as a basis for the next generation of GEPs, to be implemented after the project's closure (2025).

Targeted actions

- To increase the chance of hiring/recruiting a female candidate in deep tech we will include several activities: (i) information campaigns/recruitment advertising to reach a fair, qualified and large representative candidate pool (recruitment); (ii) creating a community of women in STEM (networking); (iii) organisation of STEM education programmes for women (awareness); (iv) creating and delivering of gender-inclusive recruitment by balancing composition between men and women in evaluation and recruitment panels (recruitment) and making talent selection process objective as much as possible when considering aspects such as CV gaps, marital status, etc. during the evaluation process (non-discrimination); (v) introduction of flexible working hours (work-life balance);
- 2) to reduce the representation gap in top positions at all levels: (i) institution of quotas (40%), especially in governing boards, executive committees and other decision-making boards (composition); (ii) increasing the visibility of women of the ecosystem (visibility) through prizes/awards reserved to women and by women participation in conferences/meeting/fairs as speakers;
- 3) to favour women entrepreneurship: (i) share of women founding a start-up supported by the ecosystem (TT); (ii) share of patent applications with at least a woman as inventor supported by the ecosystem (TT).

C.7) Post-doc engagement and international attractivity

The expected impact of the strategy for international tech talent is the creation of a robust and sustainable early career researcher system on specific topics related to climate change and fitted in the Tech4You Program as well as the increasing of connectivity to international researchers to create a competitive global marketplace for products and services produced in the ecosystem.

To engage the best and brightest doctorate holders Tech4You will offer: (1) the prospect to be involved in the development of the pilot projects; (2) access to the best opportunities outside academia career by collaborating with innovative firms affiliate to the ecosystem; (3) the opportunity to set up their R&I team/start-up within the ecosystem even beyond the closure of the Program; (4) intellectual property support from scouting to valorisation; (5) access to innovative Research Infrastructures.

Tech4You will let promising (foreign) post-doc spend their knowledge in an R&I team of the ecosystem, meshing with colleagues, fitting in with the ecosystem culture, achieve great results and will ensure to them: individual coaching (for the early-stage researchers only); further developing of their quantitative and qualitative analytical skills (for the early-stage researchers only); get access to laboratories' facilities and research infrastructures; get access to technologies with commercial potential; collaboration with mentors/ experts belonging to the ecosystems; co-direction of one or more actions foreseen in the Program; being both mentored and learn to mentor others ("Teach the Teachers").

A register on the lines of "Who is Who" will be published on the Tech4You website to record the most promising former PhD students from all over the world who are attracted to move in or return to Calabria and Basilicata (e.g. those who visited the ecosystem's universities from India, Pakistan, South America and from other EU and non-UE countries). Brain circulation mobility will be favoured through the support of existing



structures such as Welcome Offices, Euraxess service points and the publication of vademecum for international researchers, simplified procedures for settling in the ecosystem, and the direct assistance from Tech4You personnel.

Candidates with an outstanding track record will be selected through public announcements or engaged directly by the private companies in the ecosystem.

Doctorate holders:

- must demonstrate the potential to become/be leaders in their field of research and have to fit strategically to the Tech4You Program;
- are required to present a narrative CV including their profile, key qualifications, relevant achievements, motivation, etc.;
- are required to have an updated ORCID profile including all information found in a traditional CV.

Selection of candidates will be done under the gender mainstream policy of the ecosystem. The technology transfer managers of the ecosystem will make sure secret information is protected from unauthorized disclosure (NDA, MTA, other written agreements, etc.) and stored on secure systems during the period of collaboration and beyond.

Tech4You will provide awards to top local and foreign talent through its Award4You initiative, which will be regulated during the implementation of the program.

Tech4You will register a series of videos to highlight the ecosystem's vision and the role that talents will play. Video will show possible career paths, how to seize the opportunity to access advanced technologies/labs and to mesh with R&I teams. Campaign videos will tell about infrastructures, laboratories, players, pilot projects and above all interactions.

They must be based on narrations from experts/team leaders/researchers/institutional figures/general public and give a faithful representation of the cultural and natural context of the ecosystem. Peculiar aspects to be emphasised during the campaign must be coherent with the Tech4You objectives and must be related to the indigenous biodiversity, seas, coastlines, mountains, archaeological, underwater and landslides sites and many other open-air laboratories spread on the Calabrian-Lucan territory.

C.8) Stakeholder involvement

Private partners have been involved in the ecosystem at all levels:

- 1) hub level: even if a precise choice was made to constitute a subject with an overwhelming public majority, some private subjects, already indicated in section C2, have been involved in the implementation of horizontal actions (digital transformation and knowledge transfer) and functionally in charge of the hub;
- 2) spoke level: private players have been identified with specific skills, already described in section B, on the reference themes of the spokes themselves. They will co-finance with their funds in a percentage defined according to the European Commission Regulation (EU) n. 651/2014.

The following table summarizes the competencies provided by private partners.

Spoke	Private entities	Budget (€)	Competencies
2	EIT Manufacturing	500.000	See section B.2
	RINA Consulting – CSM	800.000	See section B.2
	TechFem	900.000	See section B.2
3	TIM	1.106.812,50	See section B.2
5	Biotecnomed	800.000	See section B.2
	Epitech Group	500.000	See section B.2
6	Engineering	3.000.000	See section B.2
	Entopan Innovation	4.200.000	See section B.2
	NTT Data Italia	250.000	See section B.2
	ENM*	1.000.000	See section B.2

* public entity

Cascade funding: all the spokes foresee a share, equal on average to 17% of their budgets, to involve SMEs in the program to implement the technology readiness level of outputs through open calls.

Public Engagement (PE)



PE activities will be planned to raise the attractiveness and the awareness of citizens and stakeholders (policymakers, municipalities, High Schools, Associations, Cultural institutions) through communication and dissemination initiatives for non-academic targets.

The activities aimed at the "active" and "pro-active" involvement of local public authorities and local scientific, technological, cultural institutions (museums, archaeological site, libraries, theatres, cultural academies, music conservatory, etc.) include:

- 1. <u>information activities</u> (seminars, workshops, panel discussions, world cafes, etc.) for civil society in general. A tool for disseminating the results of Tech4You's activities will be the "**Tech4Life Guide**", consisting of a showcase of all Tech4You's scientific products and their procurement/use;
- 2. <u>co-design activities</u> with the Project Partners, of sharing initiatives, able to determine co-production of knowledge (brainstorming activities for the elaboration of new guidelines in the field of quality of life and environmental sustainability; agreement protocols and conventions for joint dissemination activities; etc.). Specific activities of this type will be co-organized in collaboration with the "Forum Terzo Settore" a non-profit organization, the main unitary representative body of the Italian third sector associations. In detail, the process of information and awareness-raising are envisaged, also delivered in digital mode, aimed at disseminating the results and effects of Tech4You for improving the quality of life of the communities.

Considering the experience gained by the University of Calabria as a founding member of APEnet (the Italian Network of Universities and Research Bodies for Public Engagement), the aim is to co-create and share "Best practices" for the promotion of PE initiatives, which provide the cooperation of all Tech4You players and external stakeholders.

The ecosystem of innovation Tech4You is set to become, therefore, also an example, at the national and international level, of "**democratic'' best practices of PE**, which derive their strong capacity for action from an important experience of dialogue and cooperation among the realities that give life to the ecosystem. This is also configured as a "valid method of dialogue" to establish a virtuous and stable understanding with local public authorities.

C.9) Monitoring and ex-post evaluation: data management and indicators

Below are the KPIs to monitor the degree of success of the program. Indicators are reviewed annually by HUB Management to identify and tackle biases/gaps.

	KPI	Value
Financial Perspective	Budget Variance as program	< 10% variance of the approved budget
	efficiency	
	Cascade Funding Efficiency	< 10% variance of Open call Planned budget
	Management	
Spoke Engagement	-Time efficiency of the program	>= 80% of Pilot Projects completed
Perspective	-increase innovation in SME	>=50 SMEs involved in technology transfer activities
	Tech4You	>=20 dissemination or communication initiatives
	Global acknowledgement	(International Conference/workshop/seminar)
	Scientific and industrial	> 6 Science & Industry collaborative projects (Tech4You
	collaboration opportunities	catalyzer role)
		+20 Tech4You consortium publications (scientific and
		policy articles, abstracts, posters, position papers, etc)
		(Baseline scientific production of partner at 2022)
Operations Perspective	Training/Research	80% of PhD involved in training activities
		80%. of the new researcher involved in training activities
	Change in team structure	< 5% variance of the critical mass approved (1017)





D) PROGRAM IMPACT

Tech4You will provide economic, social benefits (Scientific, Human resource, Societal) and will contribute to enhancing the national and international position and business attractiveness of the two Regions' impact. Tech4You (31 Goals, 55 Pilot Projects and more than 90 expected results) will move research results from TRL4 to TRL 7/8. The program will generate direct effects (new knowledge, patents, spin-offs, start-ups) and indirect effects (new SMEs employees, new researchers). Following the analysis of the potential impact of the R&I program on the economic, social, and cultural system with a specific focus on impact in SMEs (new start-up and spin-off, new employees, partnership research-business). We identify also the contribution of Tech4You in bridging the gaps defined by the NRRP.

D.1) Economic, cultural, and social impact of the program

The analysis of the economic impact is conducted starting from the expected results with a 3-year forecast. We assumed that 20% of PhDs (nr. 22) and of researchers (nr.60) will create new companies (startup base value + 12%, 2021 - Source: Innovative Startup Register) and spin-offs per subject area (+31% base value, 2021 - Source: Netval, 2021). Moreover, the increase of knowledge will generate new patents (+ 30%, forecast on territorial baselines (249, Source Patriis)). The PhD industrial students' activities should involve at least 100 PhD students. 9 SMEs are involved as affiliated in the program, through open calls the program will be able to involve at least 150 SMEs.

Indicators (KPIs)	Year 1	Year 2	Year 3
Innovative start-up founded	-	31	51 (+12% of 2021 data)
University spin-off founded	-	15	25 (+31%, 2021 data)
New Patents	5	15	50 (+30%)
Researchers involved in industrial PhD program	33	33	34
SMEs involved in the Tech4You research activities	9	50	100
New researcher employees	50	50	50

Impact on social and cultural system

The social impact analysis considers both expected and unexpected outcomes (*research results that were not expected but could be generated during program implementation*). The main assumption is that new scientific discoveries may arise differently from the line that generated them (forecast % unexpected outcomes). The program can be considered successfully completed upon reaching 90% of the technologies that have reached TRL7. At least 80% of researchers women will be involved in the creation of a 'Tech4You women in the STEM community, also monitoring their participation in the creation of spin-offs and patent pending.

Cultural impact is represented through the improvement of citizens' understanding of the effects of the climate crisis, and the involvement of civil society (citizens, municipalities) in the use and testing models. Starting from a total population of about 2.4 million (about 1.9 million in Calabria and 0.5 million in Basilicata), Tech4You will plan to involve at least 500.000 (20% of the total of citizens) in Tech4You communication activities and users test. Tech4You will work in line with the European Researchers' Night, which is funded by the EU Commission (since 2018) and attracts an average of 50,000 citizens each year. Tech4You dissemination activities will involve at least 180 municipalities (35% of the total). The action of attracting talent and new PhDs will be strengthened also through national and international events to promote the research program and to present the main results.





Indicators (KPIs)	Year 1	Year 2	Year 3
Number of unexpected results (% on Pilot Project research activities)	5%	8%	10%
Number of technologies validate at TRL7 (% on Pilot Project research activities)	-	35%	75%
Total number of involved researchers/year	853	1130	1130
Total number of involved female researchers/year	39%	42%	45%
Number of female as inventor in patent pending (on total patent)	5%	10%	15%
% of women in the community Tech4You (STEM application field) on nr. totale of women in research program	50%	60%	80%
Numer of female as CEO of spin- off/Start-up (% on total nr of spin- offs or startups)	30%	50%	60%
Innovative digital solutions used by PAs for processes dematerialisation	3	6	9
Citizens and/or public communities engaged by the program reseach activities (% over the regional population).	12.500 (0,05%)	75.000 (3%)	200.000 (8%)
Nr of policymakers (municipalities and social actors) involved in dissemination activities (535 total municipalities in the two regional areas)	25	80	110
Citizens using apps developed by the program R&D projects	-	30.000	150.000
Stakeholders engaged in activities	50	150	200
Nr Cultural/Naturalistic sites addressed by the pilot activities	10	30	70
<i>Nr of communities involved in pilot test</i>	30	70	130





Number of researchers involved in Technology Transfer actions (impact pathway development, research pitch) on nr. of researcher of the program	30%	50%	60%
Number of scientific dissemination events (Regional, National, International)	6	15	15
Number of international collaboration and joint projects	6	15	20
Nr new PhD	35	35	35
Nr post-doc in patent pending (on total post-doc involved)	5%	10%	15%

National and international positioning

The national and international dimensions of the Hub will be built on the enhancement of the inbound – outbound flows of innovation and technology. The major challenge is to balance the urgency for the short-term results— particularly in terms of job creation—with the need to prepare the Regions for the broader economic transformation towards the markets of tomorrow. The setting up of a national and international web of relationships that can position the two Regions is a key accomplishment along three verticals:

- venture capital and private equity support to accompany the private sector in the transformation of economies. TECH4YOU ecosystem will embark on a process of green and digital transformation which will be combined with the demand for the third dimension of social transformation triggered by entrepreneurial activity. Venture capital will be needed to convert these ventures into long-term sources of jobs and growth, especially in the two Regions with a weaker VC ecosystem:
 - Action: the launch of dedicated innovation funds for seed and early-stage financing, prioritizing the transformation towards the future sources of economic, social and environmental value can play an important role;
 - Partners: European Innovation Council (EIC), the EU's main program to help startups scale, European Investment Bank (EIB) who act as advisers for the fund, the European Investment Fund (EIF),
- enhancing the innovation capacity of the existing firms and their need to upgrade their production and business processes and product portfolio can be debt financing remains available to support the transformation of the traditional economy. TECH4YOU will reinforce and direct the efforts to create favourable conditions for the adoption of greener technologies and the development of more job-creating, socially-oriented and sustainable product portfolios.
 - Action: access to national & international public funding and guarantee schemes, targeted R&D incentives (grants, innovation prizes) and more strategic use of public procurement;
 - Partners: CDP Venture, Invitalia, EIT the European Institute of Innovation and Technology (EIT), pooling leading companies, universities and research centres to form dynamic cross-border partnerships called Innovation Communities (KIC — Knowledge and Innovation Community).
- TEch4You is to transform a weak innovation ecosystem into a productive and robust one by improving its national and international relationships, with other Universities and R&D organisations European context:
 - Action: An international network of links and relations already exist thanks to the European projects, that see the participation of many research teams of the Regions Universities. With the present innovation project, Tech4You will foster the international vision of the local R&D organisations and SMEs with the ambition to become a leading organisation in developing new technologies to reduce climate change in the Mediterranean area



Partners: Universities and research centres in the Mediterranean countries (e.g. Spain, France, Portugal, Greece, Tunisian, Egypt and Morocco), cross-border partnership with SMEs.

Indicators (KPIs)	Year 1	Year 2	Year 3
Innovation funds for seed and early-stage financing	-	1	1
Synergies with other programmes funded by PNRR, Mission 4, C2 funds	1	2	2
Synergies with other national and international R&D centres	1	5	10

Tech4You aims to become a reference element of the Mediterranean basin, offering a research program aimed at attracting international talent. To increase the penetration of the educational offer and the research lines aimed at the development of climate technology, the Hub plans to: (1) launch innovation funds for early-stage research, create synergies with other programs (PNRR, Mission 4, C2), and (2) create synergies with other national and international centres. Thanks to Entopan Innovation (in the Hub), ENM and EIT Manufacturing (affiliated), the program will identify early-stage funding funds to support startup and spinoff companies.

2-Tech4you aims to create synergies with other PNRR projects. In line with the main goals to reduce the North/South citizen gap, the hub will manage the new network among other funded projects.

3-About Spokes' mission, Tech4you aims to create a partnership with the major European initiatives (e.g. "Hydrogen Europe Flagship", European Energy storage, European" Battery Alliance", European Partnership on Safe and Sustainable Food", Federation of European Risk Management, European Heritage Alliance, European AI Alliance, etc.) increasing the number of stakeholders informed of the R&I Program.

Bridging the gap by the NRRP

The North-South social divide of the country (identified also by Italian RFF) can be photographed through three statistical indicators: (1) gross domestic product per inhabitant (GDP per capita in euros), (2) employment of the population 18-64 years (%); (3) employment rate of women 18-64 years (%). In Italy, the gender gap in the employment rate is among the most pronounced in the EU. Women's participation in the labour market (49 %, 2020) is among the lowest in the Union and significantly lower than the EU average (67.4 %). Calabria and Basilicata are among the 10 regions of the EU with the lowest female employment rates. Mobility from southern to northern regions remains high. In 2018, more than 1.35 million inhabitants moved within national borders. The highest spending on research and development as a percentage of GDP is registered in northern Italy. The best performing regions (Emilia Romagna, 2.07 of GDP, 2019) spend more than three times as much on research and development as the worst-performing region, Calabria (0.57 % of GDP, 2019) and Basilicata (0.67 of GDP, 2019). This gap in society also involves other elements of comparison: digital infrastructure, online services for the PA, efficient waste management (domestic and industrial); optimization of the water sector, production and storage of hydrogen, fight against educational poverty).

In such an economical-social context, the R&I Tech4You program could help to reduce the gap in terms of digitization, increase employment rates including female employment, improvement of scientific skills on (reduction of energy consumption; energy reuse of waste, hydrogen production, improvement of the welfare of citizens). The Ecosystem will tackle constraints limiting as to the intellectual migratory phenomenon, the depopulation of rural areas, the low entrepreneurship propensity and need to preserve the environment, key factors requiring collective actions to mitigate fragilities and generate economic strengths.

The European Innovation Scoreboard (EIS, 2021) showed that Italy is a "moderator innovator" (more than 25 percentage points compared to 2014) registering the greatest increase in business digitalization, broadband diffusion, IT skills, and investments in R&D. Among the strengths of the Italian innovation system are the development of "innovative products and processes", "impact on employment of innovative companies" and levels of "environmental sustainability". The Regional Innovation Scoreboard indicates, in particular, a problem in the training of citizens In Italy, there are, in fact, about 7 million people of working age without digital skills. It becomes a priority to develop collaborative paths between companies, schools and universities to promote training among young people and try to bridge the gap between the skills required by the labour



market and the skills provided by the educational system. In EIS (32 indicators), Basilicata and Calabria are ranked 154th and 174th respectively at the European level. Basilicata is included among "moderator innovators", Calabria is included among "emerging innovators" because it has relatively lower innovation growth rates than other European regions. There are seven regions above the national average, "strong innovators" ('Emilia Romagna, first place nationally and 76th among all European regions). Comparable strengths "STEM graduates", "employment in innovative companies", "R&D expenditure", "Patent registered", "collaboration in R&D between SME and researchers". Moreover, there are other elements in the citizen divide in North/South Italy as digitization, employment rates including female employment, energy consumption; energy reuse of waste, hydrogen production, improvement of the welfare of citizens. The economical scenario of the Calabria-Basilicata area shows that the investment in R&I required by the Tech4You program could generate a propulsive economic and social growth, which could bring the two regions closer to the strong innovators (e.g. Emilia Romagna).

before Tech4You program				Tech4You program impact
KPI (source Istat,2019)	Emilia Romagna	Basilicata	Calabria	sovra-regional area
STEM graduates(% per 1000 population) (20- 29 years old)	18,7 %	4,7 %	10,3%	+5,3 %
Research and development employees (units expressed in full-time equivalents per thousand inhabitants))	10,1	2,3	2,0	+1,5
Researchers employed in companies as a percentage of total employees (total)	0,9	0,1	0,2	+0,1
Patents registered at the European Patent Office (EPO) (number per million inhabitants)	131,5	10,3	9,1	25
Enterprises birth rate in knowledge-intensive sectors (%)	0,8 %	10,0%	12,1%	+1,5%
Firm survival rate (three-year) in knowledge- intensive industries (%)	58,4%	48,3%	44,5%	+15%

The exploitation methodology

Our approach assumes that if a piece of knowledge is not used there is not going to be an outcome and thus any impact. Communication, Dissemination and Exploitation will be an integrated process where the Exploitation outputs will be functional to an effective Dissemination and Communication. Exploitation will feed content to inform potential users and raise awareness to the general public.

We will address the impact since the very beginning of the Tech4You programme adopting a demand-led (problem-driven) approach to respond to the challenges at the base of each of the six research plans. Exploitation experts will look together with the R&D performers at the results of their activities (Key Exploitable Results - KERs) and support them to better align results to the challenges, identifying the steps needed to increase TRL and secure further funding to ensure adoption by the regional SMEs and stakeholders. Once the KERs' use model will be defined with the partners, IP management and ownership-related issues will be addressed to facilitate use beyond the partnership itself.

Tech4You R&I Exploitation approach will consider two elements: (1) how KERs will be used to achieve Tech4You outcomes by the project partners and the regional ecosystems), and (2) beyond Tech4You how impact will be achieved (i.e., the self-sustainability of the outcomes to be leveraged and scaled after the program).

As far as use, outcomes and impact are concerned, Business planning, IP, data and sensitive information disclosure will be addressed at the Hub level. The Hub will involve META Group¹ to led the process by using

¹ META is a group active at European level in boosting the use of results stemming out from projects financed by centrally managed funds (EC framework programmes) and international innovative investments linked to cohesion policy interventions (Smart Specialisation Platforms). Thanks to its international network, the experience in different EU countries and direct contact with Horizon programme beneficiaries, META Group can establish direct contacts and build partnerships with intermediary organisations dealing with SMEs and start-ups (EBN, INSME, APRE, BAE, EURADA, etc.) and with research teams. The company is leader in bringing research results funded by the EC's Framework Programmes to use, with over 1.400 consortia



an approach and tools tested in several contracts in Europe (So far more than 1400 EC Projects have been served on behalf of DGRTD going from Fp7 to HE), as well as during the delivery of services to SMEs and start-ups to accelerate their growth. The Exploitation process will use a **"build-measure-learn"** approach involving all the partners and engaging key stakeholders to go to market.

Selection of KERs

Results, KERs, will be characterised and analysed during joint working sessions with the R&I teams (Exploitation Strategy Seminars) in terms of future use considering Unique Value Proposition – UVP, use model, market, early adopters, IP management, financials and implementation roadmap, risks and allocation of responsibilities/ownership. The output of such work will constitute the "Exploitation plan" to be released, in its provisional version, by M6 and that will be updated with the program progress. Partners will devote a specific session of each Hub Meeting to discuss Exploitation and contribute to the update of the plan, until its final release at M36.

The Exploitation/business plan will be refined by the R&I performers with the support of META Group with successive iterations integrating the inputs by the challenge/problem owners and early adopters (market, governmental and Industrial players). The work on each KER will provide inputs for the **dissemination** activities (early adopters represent the target groups and the UVP is part of the main messages) using the most relevant channels connected to each target group (early adopters). For 3 years, actions will be carried out at the Hub and Spokes level to pave the way for the consolidation of research results through the enhancement of the TRL and the launch and growth (scale-up) of high-tech entrepreneurial initiatives. Activities will include:

- Educational contributions for the R&D performers in exploitation (curricular, post-curricular, doctoral and professional);
- Services and coaching on direct and indirect use of research results, including Technology Transfer;
- **Support** to innovative startups and research spin-offs;
- **Support** in the activities of Communication, Dissemination and Exploitation by the staff of the hu.

Educational contributions (curricular, post-curricular, doctoral and professional):

- One session every semester on the use of research results and actions to be carried out also from a European perspective (2x3 workshops + 9 webinars);
- Capacity-building activities for the central office about the Exploitation, Dissemination and Communication initiatives to be repeated every year (3 meetings of 3 days each).

Services and coaching:

• Support to each research group is divided into 3 meetings a year (Exploitation Strategy Seminar) to accompany the teams during the development of research results and towards adoption by local companies/stakeholders. There will be 60x3x3 meetings (in the presence and remotely).

Support for innovative startups and spin-offs:

• Coaching services towards the preparation of the business plan and the validation of market potentials (about 20 meetings/year are assumed).

Hub-level coaching:

• Assistance to the hub staff in C&D&E activities in the initial phase of launching the activities, monitoring actions and the preparation of periodic reporting. The activity includes possible assistance at a point of presence in Brussels.

Exploitation Strategy Seminars (ESSs) - organized at the research plan/team level to work on: 1) the identification/grouping/finalising the list of key exploitable results; 2) the definition and validation of the UVP; 3) the definition of the use model and risks; 4) follow-up actions. The definition of business models, the pricing strategies and investment plan will be consolidated in the exploitation/business plans that will be developed for each KER.

The ESS results will be updated at Hub meetings. They will feed dissemination activities and eventually incorporate new KERs. The workshops will indicatively take two-half days.

During the implementation of the process, partners will be guided by META in using the following tools:

Tool	Explanation

supported at any TRL. It is also in charge of providing services for the international scale-up, through InvestHorizon 2.0, of over 500 companies, accompanied to private investors. META, through META Ventures and Xplorer Fund, gained over 15 years of experience in managing public-private funds and financial instruments, and has invested in over 100 companies across Europe. The Group is present in Italy, Belgium, Slovenia and Poland.





Characterisation	To focus on the use of a result and not just on the scientific dimension of a KER
Table, Lean	by addressing: the problem solved, the Unique Value Proposition (UVP -
Canvas	competitive advantages or innovativeness introduced compared to already
	existing Products/Services), the market, the Legal or normative or ethical
	requirements; the IPR Status and the validation of the use model (direct use,
	technology transfer, license agreement, publications, standards, financials
Value Proposition	To ensure that the KERs are positioned around what the customer values and
Canvas	needs. It helps at validating assumptions on the use
The Exploitation	To address and mitigate the risk of not being able to implement the exploitation
Roadmap	and dissemination plan and increase the TRL level, due to lack of resources (6-
	12 months after the end of the project). It analyses actions to be executed, roles
	of partners involved in the actions, milestones and measurable KPIs, costs,
	projected revenues, resources needed to bridge the investment to increase
	TRL/go to market and cover costs incurred before collecting the first revenues
	including licensing.

The Hub Level actions will entail activities related to IP management. Partners will formalise agreements on the ownership of each result, including the share of future investments and of the potential revenues generated using each KER (including IP costs as well as other certification of regulatory-related issues).

The impact table

Following an ex-ante impact table to summarize the expected impact.

Needs	Expected results	D&E&C action
Build resilient communities where greenhouse gas emissions have been reduced (SDGs goal -50% until 2050, Paris Agreement): 1-improve soil management mitigate risk and implement an early warning system 2-reduce energy consumption and save local biodiversity 3- increase communities' resilience through sustainable food 4-adapt cultural heritage to climate effects 5-increase well-being of citizens reducing effect on health (skin disorder, osteoporosis) due to air pollution and temperature increase	 early warning system natural risk adaptation; large-scale demonstrator (pilot project at smart grid pilot (at least 30 communities using the KER), hydrogen plant (1 site), reuse battery (at least 30 companies), coastal biodiversity tools and methodology (at least 50 coastal municipalities) 50 Cultural/National sites involved in pilot activities to improve accessibility at least 3 new panels for genomic/transcriptomic panel of molecular biomarkers (monitoring the effects of nutraceutics) at least 200 people use the new wearable IoT device capable of health monitoring at least 100 people use a new cosmetic product New product for the digitalization of PA (at least 9 PA) +20& Publication of a scientific thematic journal open access (gold) 	 Exploitation: Protecting the IP developed Licencing to major companies in the application fields Spin-off / start-up creation R&I Partnership creation Dissemination early adopters Conferences, matchmaking events to maximise the visibility of the Tech4you results and foster their use. Communication to the general public: At least 2 events for each spoke to show how Tech4You is relevant to improve quality of life (school involvement (all level), an association of consumer involvement to increase awareness, changing social behaviours.





	Ministero dell'Università e
Z	della Ricerca

Target group	Expected Outcomes	Expected Impact
1. Mayor companies in sever fields of Spokes' applicatio (ICT, energy, wat	KLIMA: Science and Technology Park for Sustainable Innovation	 Scientific: Breakthrough scientific discovery on spokes' theme
depuration, battery exhau	Competence Innovation	helping to move towards a
production, hydroge	Centre and Social Impact Area	resilient community
 cosmetic, inutraceutica cosmetics, cultural heritag promotion, food production) 2. Government (nation regional), 3. Municipalities (reuse of wast water treatment and coastal) 4. Regional manager of natur resources (parks, lake forests), 5. Consumer association 	(Calabria and Basilicata)	 +5% of new technological: +5% of new technologies attract the interest of Climate investors +20% of regional SMEs enhance partnership business research and introduce new R&I solutions in their business model +10% of SMEs in the open innovation process
 Consumer association (energy buyer grou wellness) Scientific communities New researchers 		 innovation process +25% of new students in STEM disciplines +35% of women in a management position +80% of municipalities involved in a climate partnership adapting climate crisis with the Tech4You new technologies the integrated R&I program Tech4You becomes an international player for climate scientists (+ 60% of research with an international partner and 40% of research with an international profile) Tech4You becomes the first research program aimed at the growth of the Mediterranean basin

D.2) Highlight any element of the synergy of the research and innovation program, with programs financed on other investments

Tech4You offers a complementary view to several other investments envisaged by the PNRR (Mission 4, Component 2). Following a comparison table that underlines the potential synergies of Tech4You with other NRRP projects.

PNRR calls	Call missions	Synergies with Tech4You
Enlarged partnerships between universities, research centres, businesses and funding of basic research projects	15 major research and innovation programmes, carried out through partnerships between universities, research centres and companies to promote a return of scientific research to the real economy. Processes will be put in place to involve citizens and transfer technology and skills locally, to businesses and the Public Administration	Tech4You starts from a partnership between universities, research centres and companies working in synergy and complementarity with this mission. Tech4You aims to increase the level of technological readiness of the product to promote local growth and improve the quality of life of citizens. The mission is to reduce the research- enterprise gap, thanks to the presence of open calls that will select companies to (1) Industrial validation of technologies; (2) Increase the number of researchers employed in companies (3) Introduce innovative solutions in companies.
An integrated system of research and innovation infrastructures	to enhance knowledge transfer developed in high-level economic research institutes, thereby stimulating innovation. To this end, the fund will finance the realisation of several infrastructures which shall address the content cross-contamination between academia and business.	Tech4You involves the IRs present in the territories of Calabria and Basilicata. Tech4You aims to strengthen the local network and to identify partnerships with national and international IRs
R&D "national champions" on specific key enabling technologies	Create national research centres capable of achieving significant capacity for innovation and research through partnerships with other centres, universities and companies.	Tech4You plans to create synergy with the new "national champion" centres to work in synergy for a common strategy of business creation. In particular, it will collaborate with the National Centre of High Technology for Hydrogen, National Centre of High Technology Environment and Energy, and Agri-Tech National Centre





I declare that I have read the information on the processing of personal data provided in the "Privacy" section <u>http://www.mur.gov.it/it/privacy</u> of the Ministry of University and Research issued according to article 13 of the Regulation 679/2016 of the European Parliament of 27th April 2016.

Date

The Legal Representative of the proposer (*Digital signature*)

Attachments:

a) Curriculum Vitae in European format of each resource engaged in the implementation of the research program